ARTICLES on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.

Motorship

ILLUSTRATIONS of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.

Vol. X New York, December, 1925 No. 12

Passengers' Comfort and Company Profits

Motorliner Gripsholm Demonstrates New Standard of Comfort and Cleanliness for Passenger Vessels and Gainful Utilization of Increased Earning Space

A NEW standard of comfort for passenger vessels is shown in the motorliner GRIPSHOLM, a standard which will revolutionize the design of passenger ships throughout the world.

This new standard tolerates neither smoke nor cinders nor oily soots to mar the enjoyment of air on deck and it prohibits the radiation of boiler heat into the passengers' living spaces. It is a standard which will begin to sweep passenger steamers into the second class trade and ultimately put them entirely out of business. So greatly are comfort and cleanliness appreciated in our modern life that the motorship could win its way to supremacy in the passenger shipping business on these points alone.

A more direct incentive, however, is given to shipowners. Increased earning space is made available by the adoption of Diesel engines. The space that the steamer wastes for boiler uptakes and engine casing is largely convertible into paying space when motors are used. This makes the vessel a better money earner.

On a large scale this was first demonstrated in the case of the AORANGI, the transpacific liner. It is shown in a more striking way in the GRIPSHOLM, because the new Swedish American liner is operating in the transatlantic service, which has hitherto been regarded as the steamers' unassailable preserve.

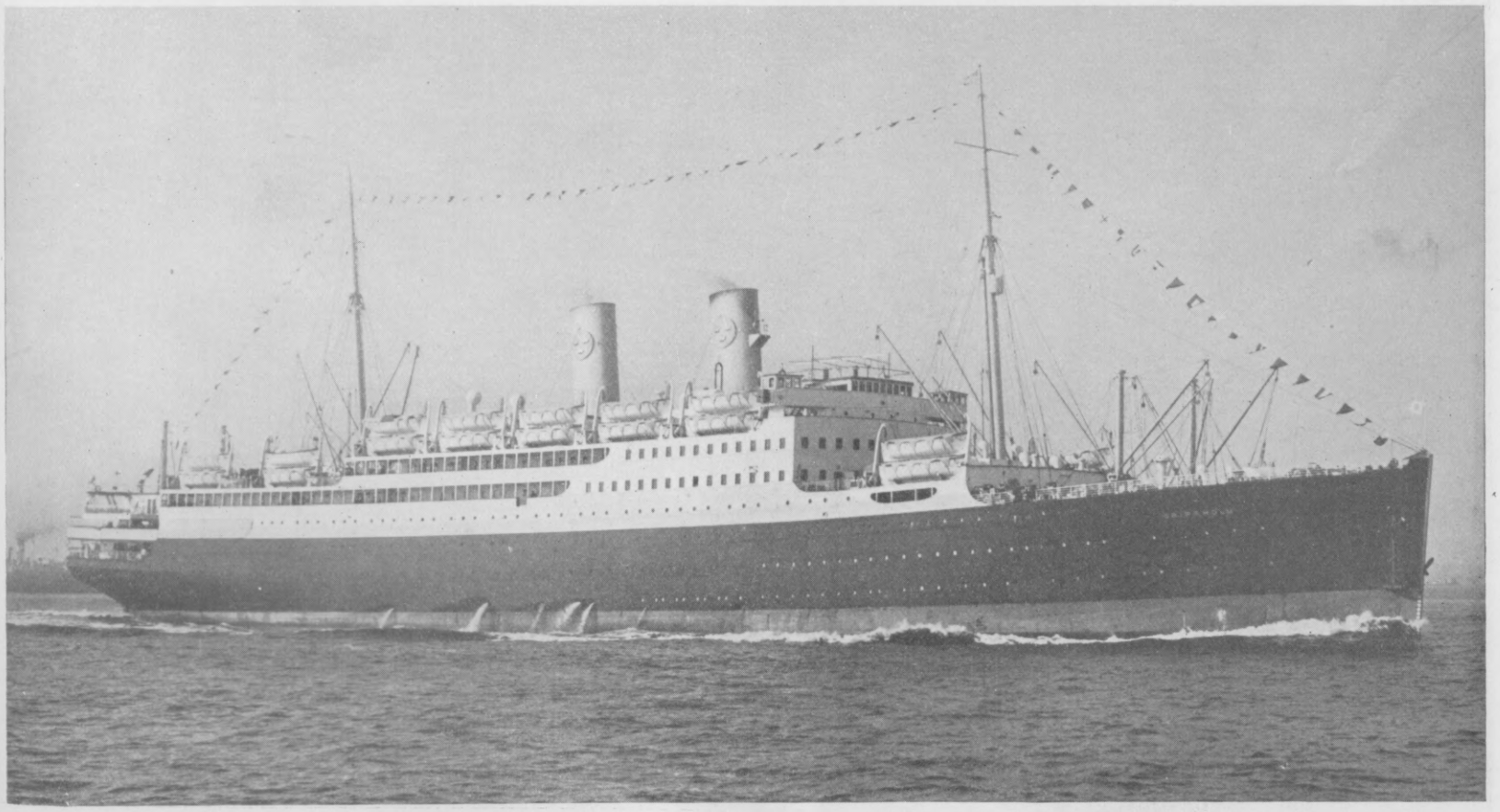
To consider the GRIPSHOLM merely on the basis of the engineering accomplishment typified in her machinery or to weigh her merit by comparing her fuel bill with that of a steamer beclouds her real significance.

To realize how great an advance the GRIPSHOLM represents in the economics of passenger ship design one should study her internal arrangements and observe that the machinery spaces are little more than lower holds interfering scarcely at all with the utilization of the midship spaces on the decks above them.

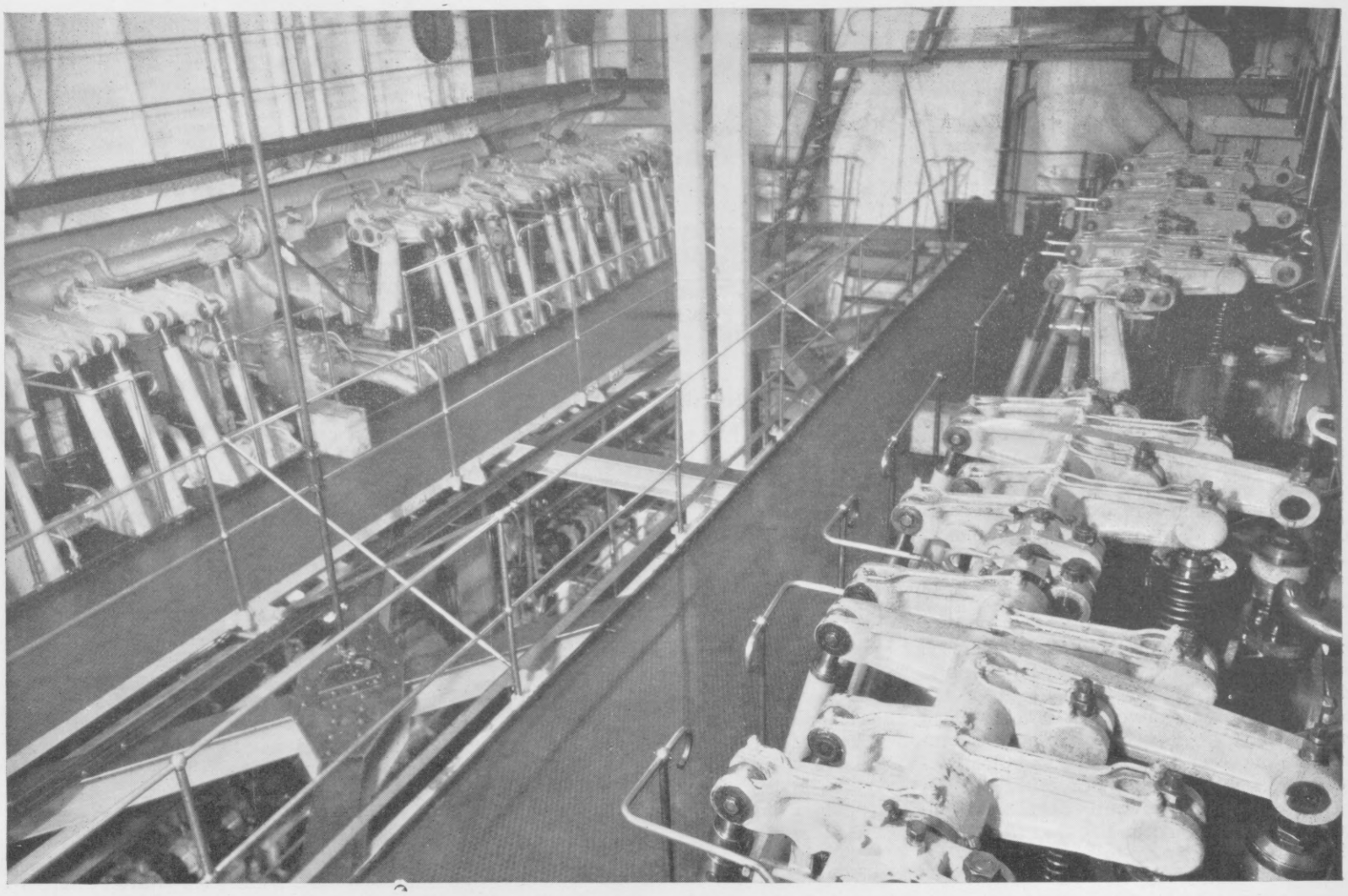
Bear in mind when studying the plans of the ship, that neither heat nor smoke nor foul smell of oil assails the passengers on this vessel, and then you can picture to yourself that the GRIPSHOLM has more of the character of a yacht than any liner yet seen in the North Atlantic service. Every passenger boat can attain the same standard, and the traveling public will soon learn to patronize the vessels of that class.

GRIPSHOLM affords a lesson for all companies operating passenger ships. The biggest companies on the Atlantic can no more afford to ignore it than the smallest companies in the coastwise service can do. Those who are building passenger steamers today are following in the footsteps of the men who built sailing ships after the Civil War.

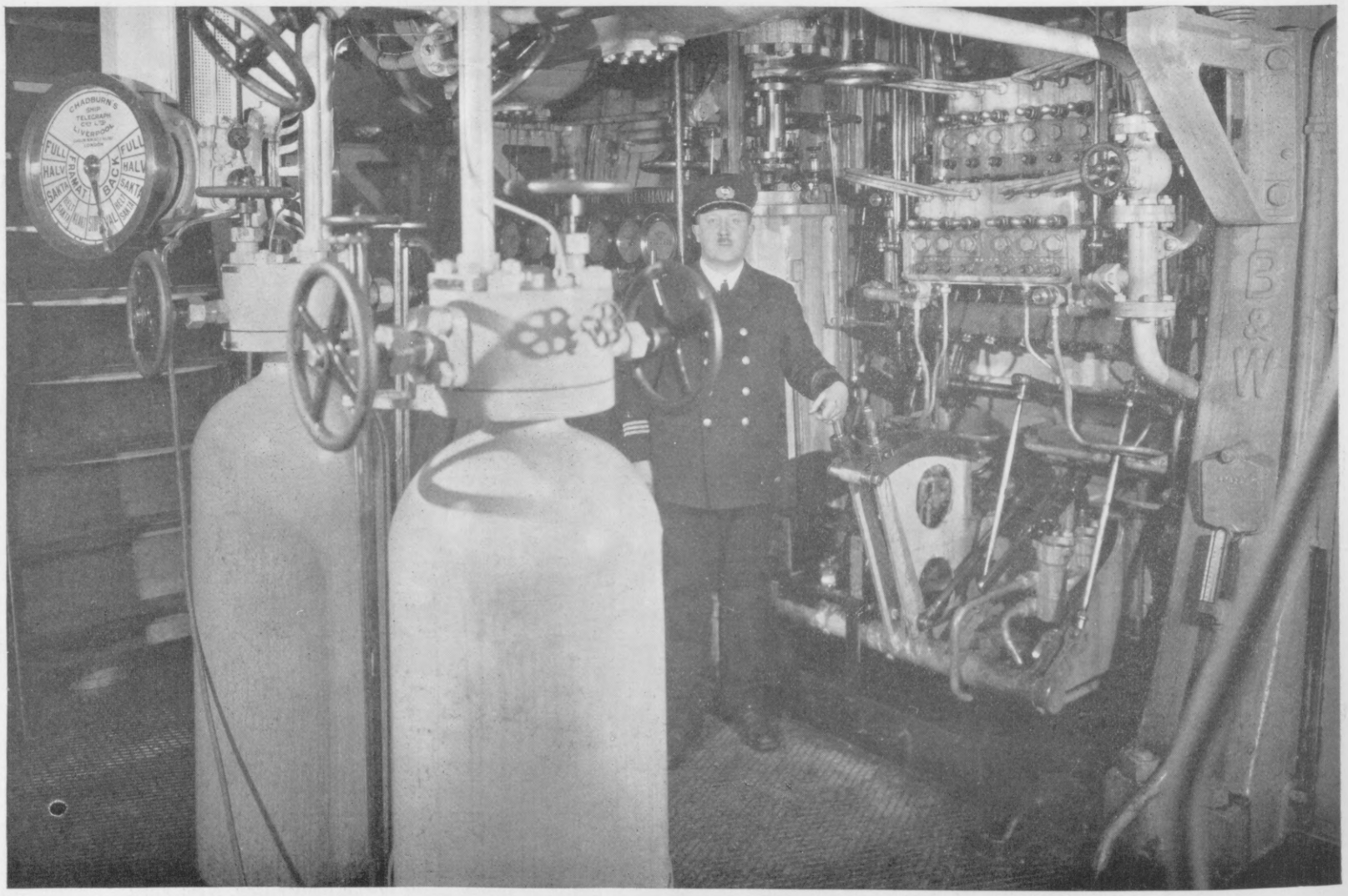
Young companies find their opportunities while their competitors sleep. If the big companies of today shut their eyes to the irresistible coming of the motorship their place will be taken by the younger and more progressive ones.



Gripsholm, 17,300 *tons gross, the first motor passenger liner on the Atlantic, is shown above in the Upper Bay, New York*



On the top grating in the engine room there is nothing to distinguish the engines from the single-acting type



Chief Engineer Allan Thorell at the starboard controls—only the extra fuel pump group attests the double-acting engine

In the Main Engine Room of the Gripsholm

Simplicity Characterizes the Installation of the Powerful Double-Acting Engines of 16,300 i.hp.

DIESEL prepelling machinery is what gives the GRIPSHOLM her distinctive character as a big passenger liner. Remarkable though her engines are, the influence which they have apparently had on the design of the entire vessel is even more amazing. It is essential, in studying her propelling equipment, to keep this fact constantly in view lest the picture be thrown out of focus. By giving the naval architect more space to work with and the marine engineer less to worry about, the Diesel machinery of this great liner has made it possible to show the shipping world how to set a new standard far in advance of previous achievement.

Considered in relation to the tremendous results accomplished, both the mechanism of the double-acting engine and the arrangement of the auxiliary machinery is the simplest that has probably been placed aboard any ship. That this is an understatement rather than an exaggeration of the truth will become more and more inescapable as the machinery installation of the GRIPSHOLM is examined in detail.

Contrary to expectation, therefore, the amount of description necessary to convey an adequate idea of the GRIPSHOLM'S machinery does not have to be more extended that it would be for the ordinary Diesel cargo vessel. No greater mistake could be made than to assume that because the great double-acting engines have two sets of valve gear instead of one, they are intrinsically more complicated.

There are two engine rooms, one for the main units and the other for the auxiliaries. Here again there is an opportunity for superficial observation to mislead particularly those steam marine engineers who are accustomed to think of engine and boiler rooms with wide open trunks extending up through the upper decks to the fiddley top. These are but a few of the notions which the advent of the large motor passenger liner has begun to make inapplicable.

On the motorship GRIPSHOLM the main engine room extends clear across the ship only in the way of D, E and F decks, while the C, B, A and boat decks are broken through only for a length of about 7 frame spaces. The width of the casing surmounted at the top by a skylight is only sufficient to allow the largest single engine parts to be hauled up and down. A part of the first class accommodations such as barber shop, lavatory, and smoking rooms are actually located above the main engine space.

This applies even more strikingly to the auxiliary engine room compartment. The galley is located directly over this space, and the small trunk leading up from it contains a ladder along with the flue from the two Scotch heating boilers and some other details of that kind. A large number of important crew and passenger spaces, including the first class library, are situated directly above the auxiliary Diesel engines. On a steam-driven liner, where boilers, coal dust, and heat would have to be allowed for, no such utilization of the space could have been made.

The two main double-acting four-cycle Burmeister & Wain engines installed in the after of the two engine rooms are rated at 6750 s.hp. each with bore and stroke dimensions of 840 mm. x 1500 mm. (about 33 in. x 59 in.) and normally turn at 125 r.p.m. Although these engines work with the same air-injection system as that used on single-acting Burmeister & Wain machines, there are no compressors on them, the injection and starting air supply being furnished by independent Diesel-driven compressing sets.

The engine room crew at present carried on the GRIPSHOLM consists of the following, totalling 39:—

1 Chief Engineer	3 Firemen
9 Assistant Engineers	3 Electricians
1 Deck Engineer	1 Storekeeper
18 Oilers and Wipers	3 Egineers' Mess Boys

Normally there are two assistant engineers on watch in the main engine room with one assistant to look after the auxiliaries.

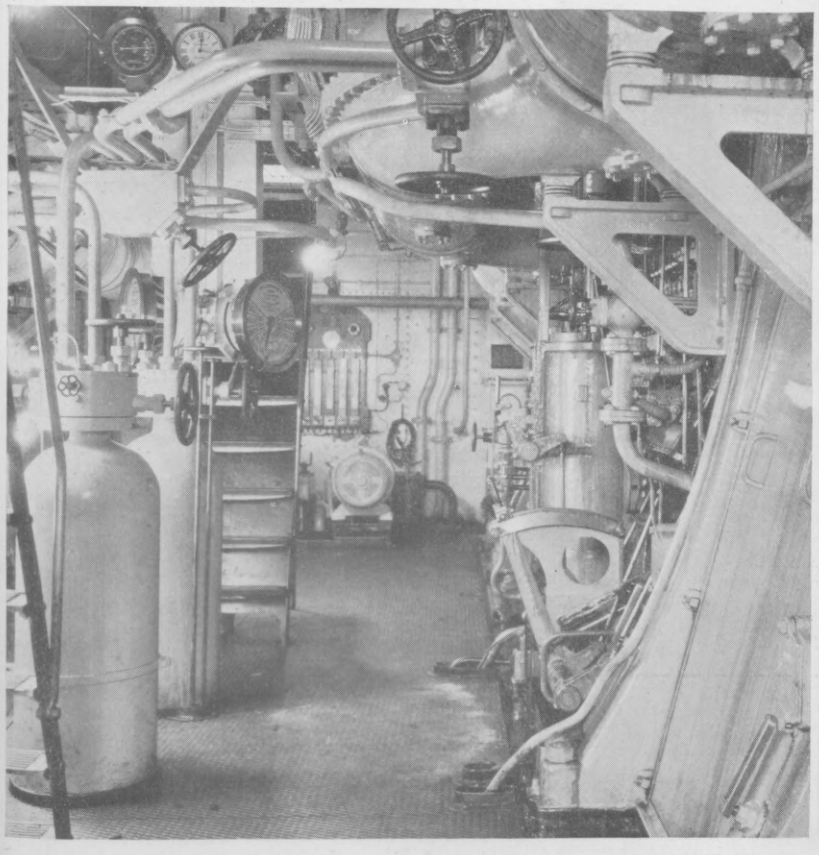
Power measurements were made each day on the engines during the voyage from Gothenburg to New York, and the following results are typical of them:—

PORT ENGINE

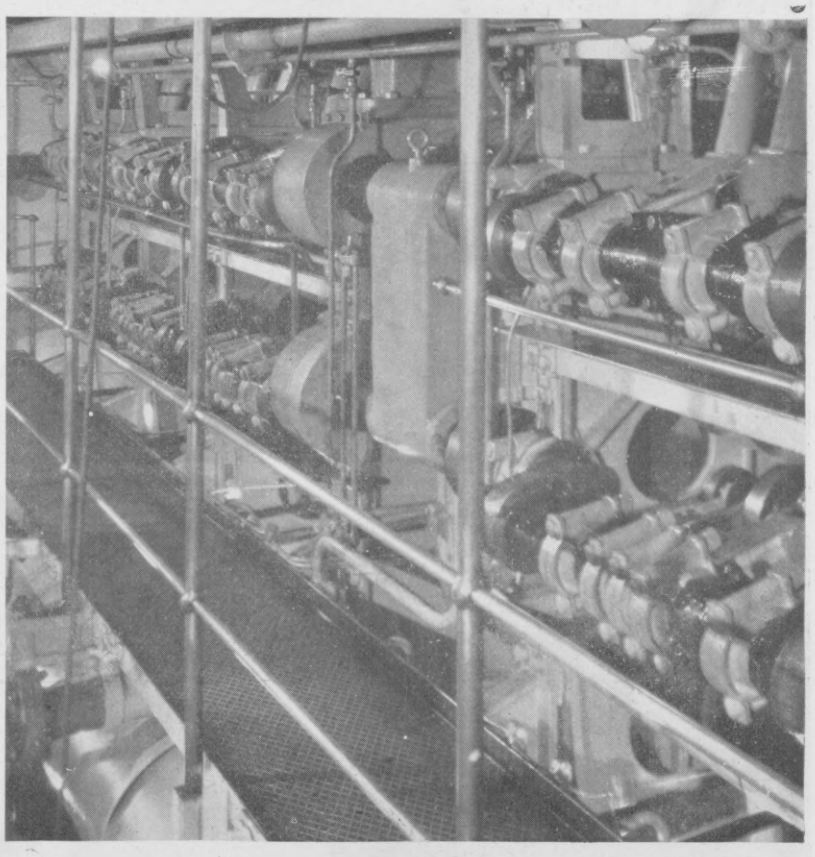
	M.i.p. lb. per sq. in.	R.p.m.	I.hp.
Head End.....	97.3	115	4370
Crank End.....	95.2	115	3620
Port engine.....			7990

STARBOARD ENGINE

	M.i.p. lb. per sq. in.	R.p.m.	I.hp.
Head End.....	97.5	114	4340
Crank End.....	97.1	114	3655
Starboard engine			7995
Total both engines			15,985



Looking forward along the starboard engine



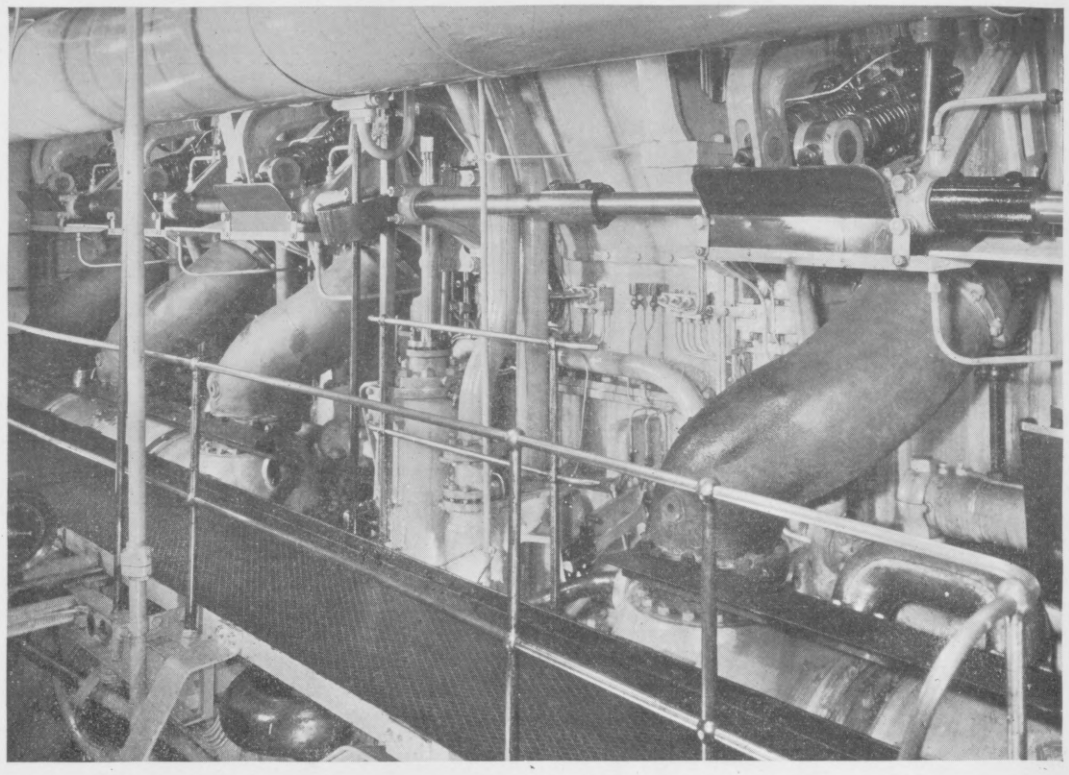
Upper and lower guide-link shafts

The indicated power of each engine averaged close to 7870 i.hp. for the whole voyage, and reached a maximum of 8075 i.hp. for 24 hours. Allowing for the fact that there are no compressors attached to the main engine and that the double-acting feature greatly reduces the amount of indicated horsepower lost in friction, a mechanical efficiency considerably above that found in single-acting 4-cycle machines should be allowed. If the efficiency is conservatively estimated at 87.5 per cent, the power actually transmitted to each shaft should be close to 7000 s.hp., a figure which exceeds the rated output by 250 hp.

For the first time the figures given above make it possible for marine engineers to get an idea as to how the development of power is distributed between the head ends and crank ends of the cylinders. Remarkable is the fact that the mean indicated pressure is kept practically the same for the crank ends as for the head ends—an interesting sidelight on the confidence placed in the functioning of the double-acting principle.

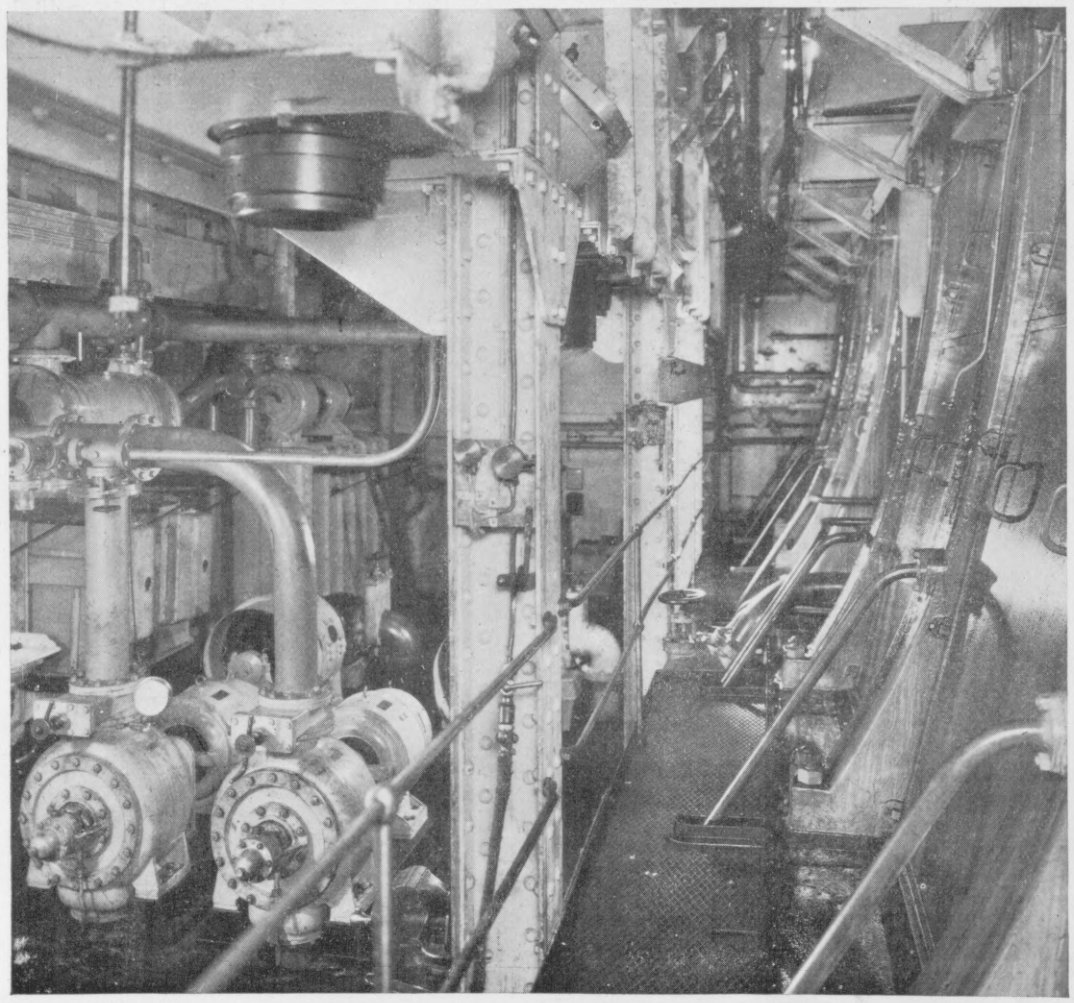
The difference in the horsepower developed in the crank and head ends is therefore only that due to the lower piston area rendered ineffective by the presence of the piston rod and stuffing box, the effective diameter of which is 330 mm. or 12.99 inches.

On the voyage across the Atlantic the average daily consumption of fuel oil by the main engines amounted to 47.2 tons while the auxiliaries for air compressing and electric generating consumed 10.4 tons per day. The make-up of fresh water for engine cooling purposes was too small to be measurable; the gross amount in circulation being only 175 tons.



Fuel valves and starting valves for the bottom ends of the cylinders

To those familiar with the latest design of Burmeister & Wain single-acting engine the double-acting feature of this machinery appears to have been arrived at by a simple and easy transition. It will be recalled that the top cylinders of all the later B. & W. engines have square contours which permit of their being flanged together sideways in such a manner as to produce a single rigid beam running across the top of the engine. In a way it is therefore incorrect to speak of a cylinder head at all, because the combustion space now amounts hardly to more than a pocket cast into the frame structure. The latter is no longer complicated by exhaust and inlet valve pockets. Nothing but a simple tubular passage, unbroken sidewise for cored passages, connects the combustion space with the outside of the casting. Air and gases pass through the separately inserted valve cages which project out to permit of their being connected by means of flanges to piping independent of the engine structure.



Back of the starboard engine, showing pumps and coolers in the wing

As the result of this development a strikingly small amount of difference really exists between the upper and lower cylinder covers. The latter, like the top ones, are rectangular in shape and flanged together in such a way as to produce a continuous beam resting on the tops of the A-frames characteristic of all Burmeister & Wain designs. Bearing in mind that the top heads form an exactly similar structure, the engine framing now boils down simply to a row of cylinders clamped between two beams, an upper and a lower one. The upper and lower combustion spaces have thus been reduced to mere incidents of the structure.

The usual tie rods haul the upper beam down against the cylinder barrels, forming columns which rest on the lower beam. The beam rests on the A-frames and the A-frames on the bedplate. The major component parts of the engine are listed below in the order in which they are found assembled:

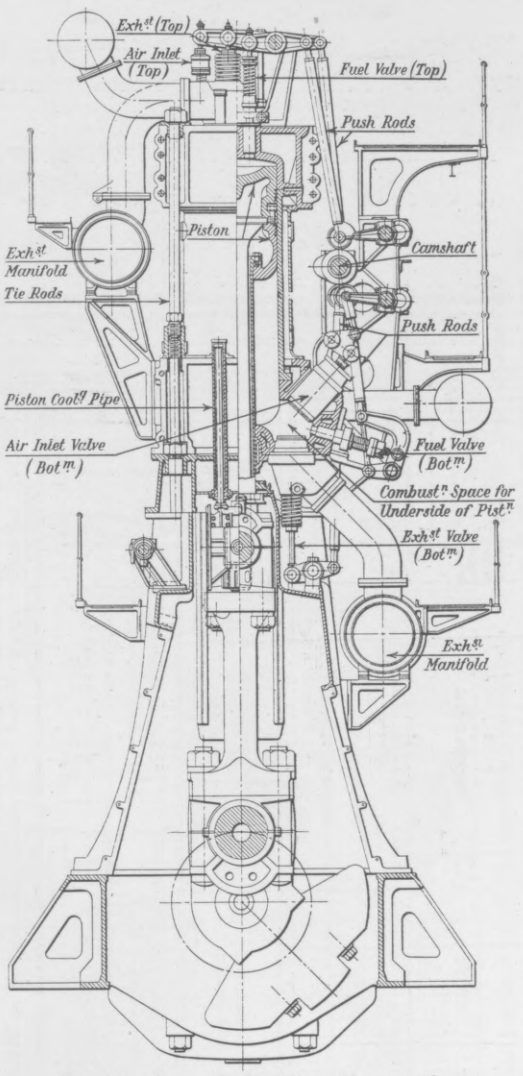
Upper cylinder-head beam.
Cylinder barrels.
Lower cylinder head beam.
A-frames.
Bedplate.

That is a complete list, so far as essentials are concerned. Tie rods running from the top side of the upper beam to the under side of the lower beam connect the structure firmly together. As the cylinder barrels expand when warmed up, they slightly increase the initial stretch to which the tie rods have been subjected by the

tightening up of the huge nuts. Owing to the great length of the tie rods they resemble a spring with a large number of coils and requiring a large amount of elongation for a given increase of stretching force. Note that the strain imposed by the big nuts is the force which makes up both the top and the bottom joint between the cylinder barrel and the two combustion spaces. The problem of making up a bolted joint at these otherwise difficult places is therefore prevented from even arising.

As is the case with the single-acting machines, the water jacket consists merely of a light shell surrounding the actual cylinder liner and jointed to the upper and lower cylinder beams in such a way as to take care of expansion. The water-jacket shell takes no part in the transmission of forces, whereas the inner cylinder barrel is subjected to compression only.

The lower cylinder heads differ from the upper ones only in that the combustion space is formed by means of a pocket located at the side and containing the openings of the various tubular valve pockets. Of these the exhaust valve tube extends downward and the inlet valve upward, while the fuel and starting valves project into the combustion spaces with a slightly rising slant. When the piston is at the bottom dead center, all the clearance volume is concentrated in the combustion space pocket, with the result that the piston rod is best protected against the combustion gases at the time when the peak of the firing is in progress. As the spray of fuel is directed substantially at the center of gravity of the combustion space, it would impinge on the rounded contour of the piston.

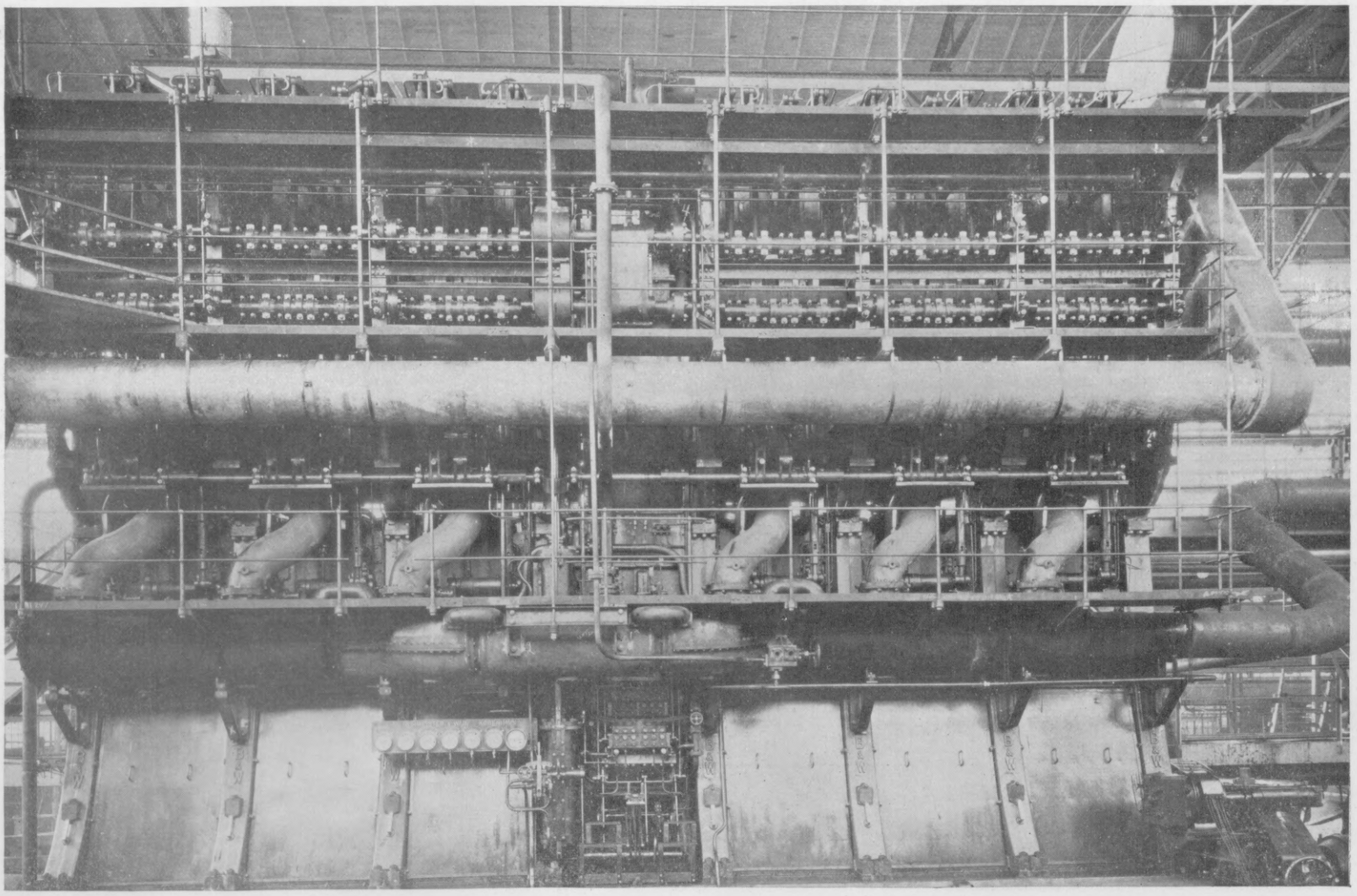


Section through double-acting engine

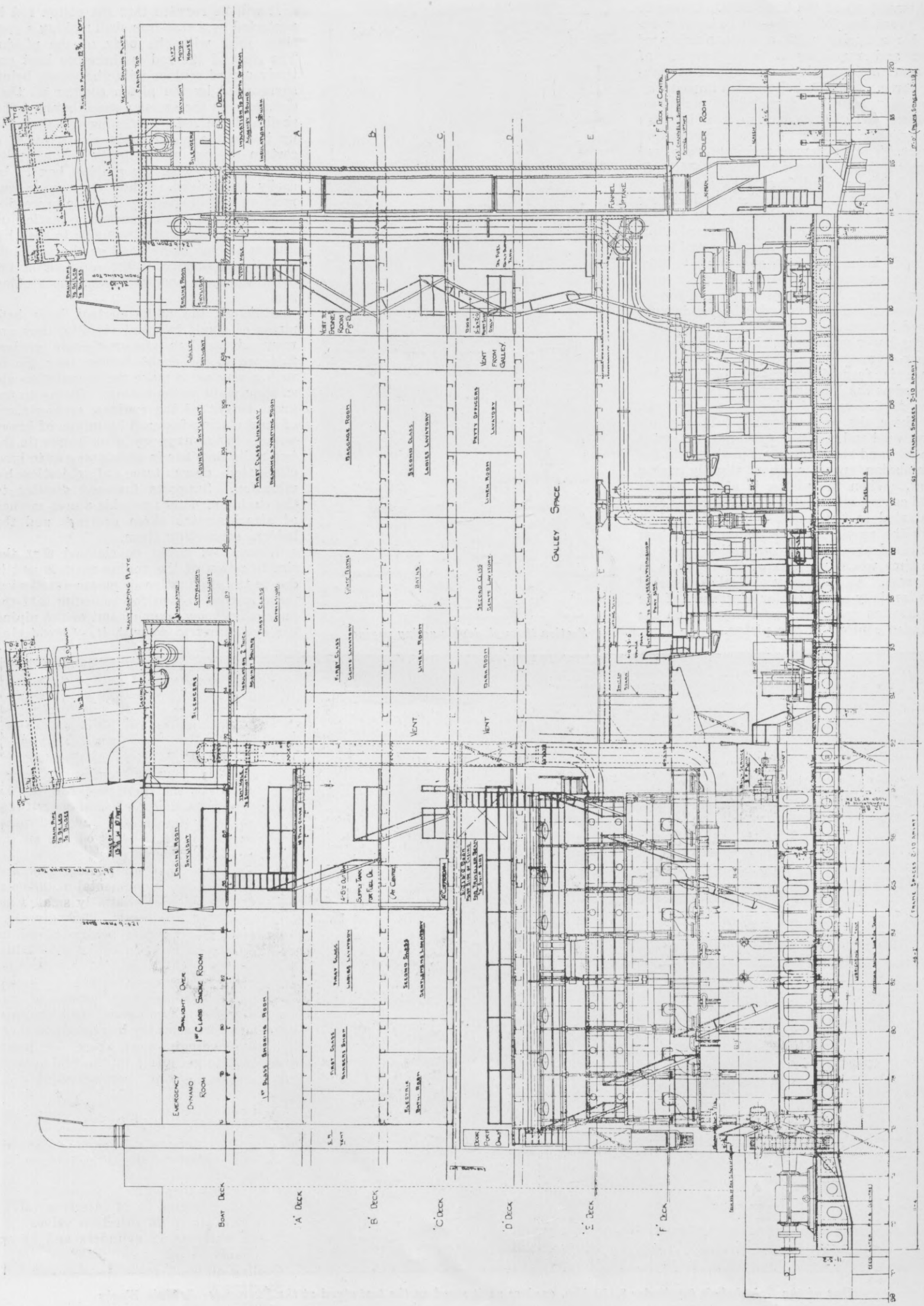
It will be recalled that the piston rod is protected by a cast-iron shell making a gas-tight joint with the body of the piston. The steel of the rod is therefore kept entirely out of contact with the gases, being surrounded by the piston cooling oil that circulates in the annular space between the shell and the rod. Fastening the shell far up inside the piston body also gives it a certain amount of flexibility that permits its alignment with the stuffing box to be easily maintained. While the engine was running at full speed as the ship proceeded from the New York Quarantine station up to her dock, the writer was able to keep his fingers as long as he liked on the brilliantly polished surface of the rod just at the point where it emerged from the stuffing box.

Although the main engines have bedplates of ample inherent rigidity, they are mounted on deep plate-and-angle girders fastened to the double-bottom tank top in such a way as to make the installation absolutely rigid at the bottom. Owing to the great height of the engines, cross-girders of steel plating fastened by means of heavy gussets to the upper cylinder beams tie the two units together in such a way as to have eliminated every trace of objectionable vibration. Supports fastened directly to the engine structure provide a neat method of attaching the three gratings and the ladders connecting them.

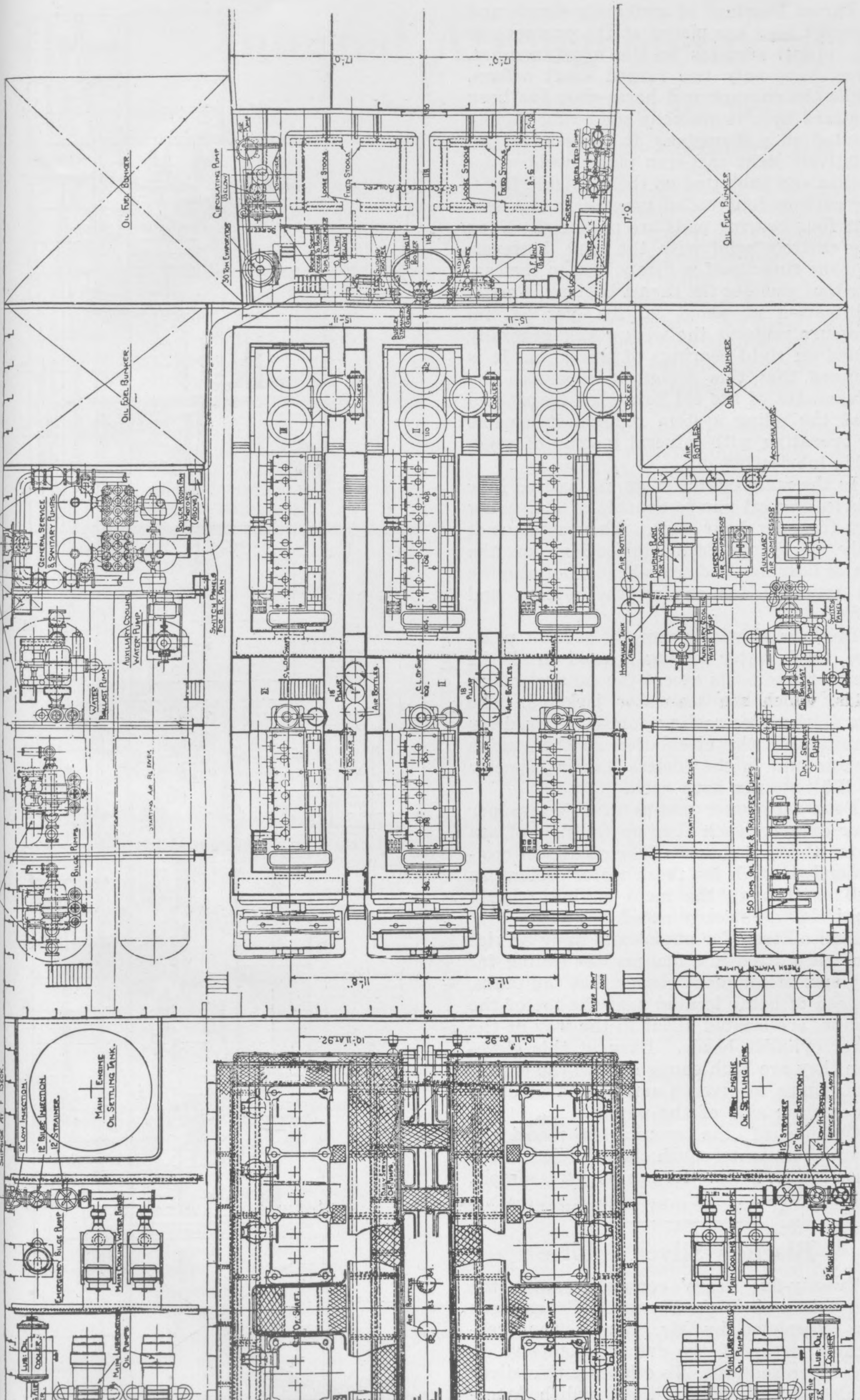
Whereas it might be claimed that the simplification of the engine room layout is due to the elimination of power auxiliaries, there is good reason for believing that the unusually clever arrangement of the piping has something to do with it. Considering



One of the Gripsholm's 6-cylinder 8,150 i.hp. engines as it stood on the test stand at the Burmeister & Wain Works



Elevation through main engine room and auxiliary engine room of the Gripsholm, clearly showing that nearly all the space above them is profitably employed.



Plan of the engine rooms, showing the layout of the auxiliary engines and of all the auxiliary equipment (including the heating boilers)

the fact that valve operating gear extends both upward and downward from the camshaft and that this machinery therefore quite closely covers up the front of the engine, great credit is due for the skill shown in arranging the pipes notwithstanding this handicap. At the same time it is to be borne in mind that the large size of the engine parts offers a far greater number of locations in which piping may be conveniently placed than is the case with engines of ordinary proportions. As far as could be observed there is not a single pipe or tubing joint inaccessibly located and every length of pipe appeared to be capable of ready removal.

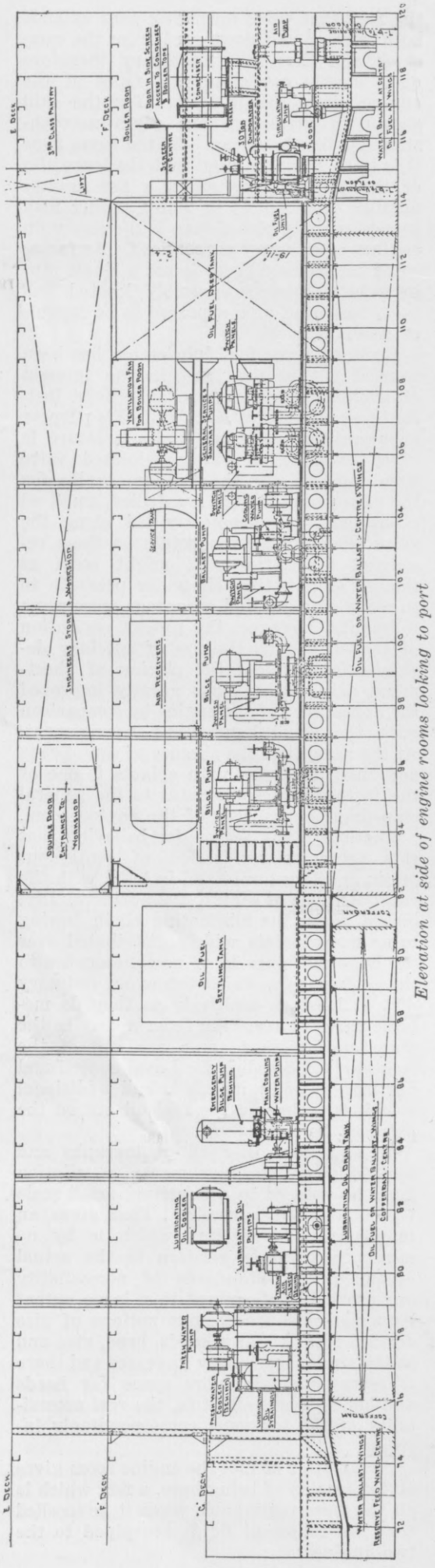
Enclosed force feed lubrication has been worked out to the limit in the interest of avoiding the messy paraphernalia incident to hand lubrication. With this purpose apparently in view, oil under pressure is piped even to the knuckle-jointed valve stem tappets. As the fulcrum shafts for the valve rocker levers are drilled, small oil tubes can be conveniently led along the valve levers to all the points on them requiring lubrication. It might seem as though distributing oil under pressure to so many places would encourage messiness; in reality, however, the proper regulation of the oil supply, the use of specially designed fittings and the placing of sheet-metal drip catchers has greatly improved the appearance of the engine by comparison with the usual hand-oiling arrangement. At the same time the absence of squirt cans and small oil tanks with spigots is one of the factors that contributes to the general ship-shape appearance of the engine room.

There is every reason for believing that this intensive application of continuous pressure oiling goes hand in hand with the consistent use of centrifugal purifiers. Dirt picked up by the lubricating oil in flowing to so many points widely distributed over the huge machines is of no consequence to the centrifugals, which throw out ordinary dirt at least as positively as they do metallic particles resulting from wear. In the main engine room there are two of the largest-sized Swedish De Laval centrifugal purifiers already installed, and additional machines to handle the fuel oil are on the point of being ordered.

It is a pity that all photographs and illustrations of this monumental installation must be reduced to a relatively small scale for publication purposes. That gives an impression of crowding which is by no means justified in relation to the actual arrangement. Standards of accessibility are probably determined to a large extent by a person's unconscious notions of size derived from his own hands, head, etc., and as the size of machinery increases and there is correspondingly more space for heads and hands to get about in, the real accessibility of the job must correspondingly increase.

As a matter of fact the engine room gives an impression of being bare, a fact which is all the more remarkable when it is recalled that the following fluids are piped to the two engines:

Fuel supply to pumps.
Fuel from pumps to 24 injection valves.
Injection air to 24 injection valves.
Fresh water to 12 cylinders and 24 exhaust valves.
Cooling oil to 12 pistons and rods.
Starting air to 24 cylinder heads.
Exhaust from 24 cylinder heads.



Elevation at side of engine rooms looking to port

Good crane service is provided with heavy chain hoists running on overhead trolleys. Spares and supplies are neatly, but accessibly, stowed on decks at each side of the engine space and some parts are carried in store-rooms.

Thrust bearings of strikingly simple and compact type are placed at the entrance to the tunnel recesses in the usual manner. They have only two forged shaft collars, while the conventional horse-shoe has been replaced by a continuous solid ring rigidly jointed on a diameter. It is made of two relatively light cast-iron plates webbed together and babbitted on their outside faces. By cutting four radial grooves in the babbitt four bearing pads are produced. They are entirely solid with the ring, however, and the ring itself is firmly held in the casing that encloses the thrust bearing. Forced lubrication at about 10 lbs. per sq. in. pressure replaces the wick oiling generally found on rigid bearings of this kind. It is claimed that this design incorporates the advantages of the old horseshoe thrust and that the oiling system renders it capable of operating with mineral instead of vegetable lubricating oil.

In the main engine room are located four lubricating oil pumps capable of delivering 200 tons per hour each. They supply not only the force feed lubrication for the major bearings and cross-heads, but also the oil required for cooling the pistons and rods.

In contrast with generally current practice, fresh water cooling is used on all the main engine parts except the exhaust manifolds, which are sea-water jacketed. The two fresh water cooling pumps required for maintaining the circulation in the engine jackets and in the coolers have a capacity of 175 tons per hour each.

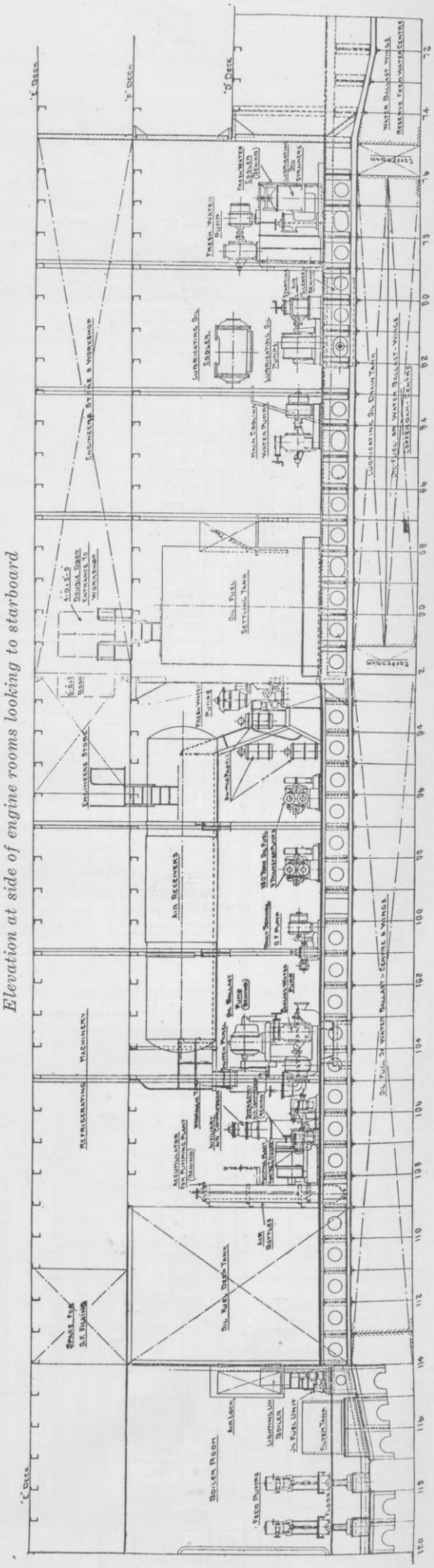
Four salt water pumps of 175 tons per hour capacity each keep up the flow of sea water through the two lubricating oil coolers and through the fresh water coolers, as well as through the main engine exhaust manifolds as already noted.

Fuel oil transfer pumps and daily service tanks are fitted in a manner not calling for any special comment except that the tanks, instead of being located near the top of the engine, are located about in the way of the lower cylinder heads. Even at this elevation they are high enough above the engine fuel pumps to give an ample head of oil to the suction side of the pumps.

Outside of the auxiliaries mentioned above there is not much else installed in the main engine room. Its equipment is simple, but adequate.

Blache's Silver Jubilee

Twenty-five years' connection with the Burmeister & Wain Works in Copenhagen was completed by Mr. Blache, the technical director of the famous company on December 2nd last. To celebrate this silver jubilee Mr. Lindahl of the Swedish American Line gave a lunch in Mr. Blache's honor aboard the GRIPSHOLM at her pier in New York. Mr. Blache's friends confirmed the statement that his career with Burmeister & Wain has been so entirely taken up with work that it has been what he terms "otherwise uneventful." After graduating in Copenhagen he studied in Germany and England before joining Burmeister & Wain in 1900. He was appointed chief engineer in 1914, assistant technical director in 1919 and technical director in 1920. His biggest accomplishment has been his latest, namely, the successful completion of the first two double-acting engines of the type he evolved for Burmeister & Wain.



Elevation at side of engine rooms looking to starboard

Drydocking the Gripsholm

When the motorliner GRIPSHOLM arrived in Gothenburg to be commissioned, she went to the Eriksberg Mek Verkstads A.B., which possesses the only drydock in Sweden capable of lifting her.

Internal Arrangements of the Gripsholm

Detailed Description of the Better Utilization of Space Which Diesel Machinery Has Favored.

GRIPSHOLM, recently completed at the Armstrong Yard of Sir. W. G. Armstrong, Whitworth & Co., was designed and built by that firm to the order of the Swedish American Line for the direct service between Sweden and America. She was constructed under the personal supervision of Director Filip Lindahl of the Broström Lines.

The principal dimensions of the vessel are—

Length overall	574 ft. 6 in.
" between perpendiculars	550 ft. 0 in.
Breadth, extreme	74 ft. 3 in.
" molded	74 ft. 0 in.
Depth molded to boat deck	76 ft. 6 in.
Depth molded to D deck	42 ft. 6 in.
Load draft	29 ft. 0 in.
Load displacement	23,600 tons
Gross tonnage about	17,300 tons
Speed (contract)	17 knots
Deadweight about	10,000 tons
Oil fuel capacity	2,450 tons
Lubricating oil capacity	80 tons
Fresh water capacity	1,050 tons
Stores capacity	800 tons
Cargo capacity	5,800 tons

There is in the vessel approximately 284,000 cu. ft. of ordinary cargo space and about 13,200 cu. ft. of insulated cargo space, whilst in addition there is provided 11,000 cu. ft. for the refrigerated ship's stores and 16,000 cu. ft. of ordinary store room space. Mail and baggage rooms of about 10,000 cu. ft. are also provided.

GRIPSHOLM has a straight raked stem and an elliptical stern, and is fitted with two funnels and two pole masts. Over the upper deck is a continuous shelter deck, with a long bridge deck over the shelter deck extending from No. 2 hatch to No. 6 hatch, a promenade deck over the bridge deck extending from No. 3 hatch to No. 6 hatch, and a boat deck over the promenade deck from No. 3 hatch to No. 4 hatch. There are eight decks in all, designated—

Boat Deck		
Promenade	or A	deck.
Bridge	or B	"
Shelter	or C	"
Upper	or D	"
Main	or E	"
Lower	or F	"
Orlop	or G	"

The vessel has been specially strengthened forward against ice and slamming.

A cellular double bottom extends the whole length of the vessel between the peak bulkheads, the various compartments therein being utilized for the carriage of oil fuel, lubricating oil, feed water and water ballast.

Ten main transverse watertight bulkheads are fitted in such positions as to ensure that, in the event of any two adjacent compartments being laid open to the sea, the vessel will still possess sufficient reserve buoyancy to enable her to be safely navigated to the nearest port in moderate weather.

Hold

The forepeak is fitted as a water ballast compartment, whilst the next three compartments consist of Nos. 1, 2 and 3 cargo holds respectively.

Immediately abaft No. 3 hold is situated the Aquasanium, comprising a comprehensive group of "health" baths, a swimming bath 30 ft. long by 15 ft. broad with an observation gallery, a room completely fitted with the latest type of electric baths, and a Finnish bathroom suitably equipped with all the appliances necessary for this type of vapor bath.

Immediately abaft the swimming bath is a compartment containing two auxiliary boilers for the thermotank heating system, cooking, heating of crew's quarters and bath service, whilst at the sides of the swimming bath and boiler compartments are situated deep oil fuel bunkers.

Sister Vessel of Motorliner Gripsholm Ordered

A second motorliner similar to the GRIPSHOLM has been ordered by the Swedish American Line for its service between New York and Gothenburg. This order has been placed, it is understood, with the Götaverken, which will build both the hull and the machinery. The contract price is reported to be in the neighborhood of 15,000,000 kr. which is about 1,000,000 kr. more than the cost of the GRIPSHOLM. The sum of 5,000,000 kr. has been loaned for the second motorliner by the Swedish Government from its special Shipbuilding Loan Fund.

The midship portion of the hold is given over to the two machinery compartments, in the forward of which are installed the Diesel driven air compressors and electric generators occupying the central portion of the compartment, the sides being devoted to workshops, stores, ice machines and pumps. The aftermost compartment contains the main Diesel engines, and the sides of this compartment are utilized for the oil fuel settling tanks, lubricating oil pumps, engine cooling pumps, purifiers, etc.

Abaft the machinery compartments the space in the hold between the shaft tunnels is utilized to provide No. 4 and No. 5 cargo holds. Outside the shaft tunnels are situated the fresh water tanks, three on either side, extending the full length of No. 4 hold. The space outside the shaft tunnels abreast No. 5 hold is available for cargo, whilst the space abaft No. 5 cargo hold under G deck is utilized as a common shaft tunnel.

G Deck

The fore peak at the level of G deck is fitted as a water ballast compartment and chain locker, the next two compartments as 'tween deck spaces, whilst the 'tween deck space over No. 3 cargo hold has been fitted for the carriage of refrigerated cargo. This deck is omitted over the length occupied by the Aquasanium and the machinery compartments, and over No. 4 hold the space is fitted up for the storage of the ship's stores. 'Tween deck spaces over No. 5 and No. 6 holds are available for cargo whilst the after peak is fitted as a water ballast compartment.

F Deck

Immediately abaft the fore peak bulkhead on F deck are fitted the quarters for the motormen, electricians, etc., who are housed in 11 separate rooms fitted with two or four berths in each. Abaft No. 1 hatch are the baggage room, specie room and mail room. Over No. 2 hold is arranged accommodation for stewards, waiters, barbers, etc., in 2- and 4-berth cabins, with bathrooms, toilet, etc. for the use of this portion of the crew adjacent.

Over No. 3 cargo hold are berths for 144 3rd class passengers in 34 4-berth cabins, and four 2-berth cabins, whilst immediately abaft these compartments and connected therewith through two power-controlled watertight doors in the divisional bulkhead is the forward 3rd class dining room, having seating accommodation for 214 persons.

F deck is omitted for the length of the machinery spaces, except at the sides of the vessel, where the spaces are utilized for engineers' stores and refrigerating machinery, linen room, and steward's stores.

Immediately abaft the machinery spaces on F deck, for the length occupied by No. 4 hold, is the after 3rd class dining room having seats for 280 persons

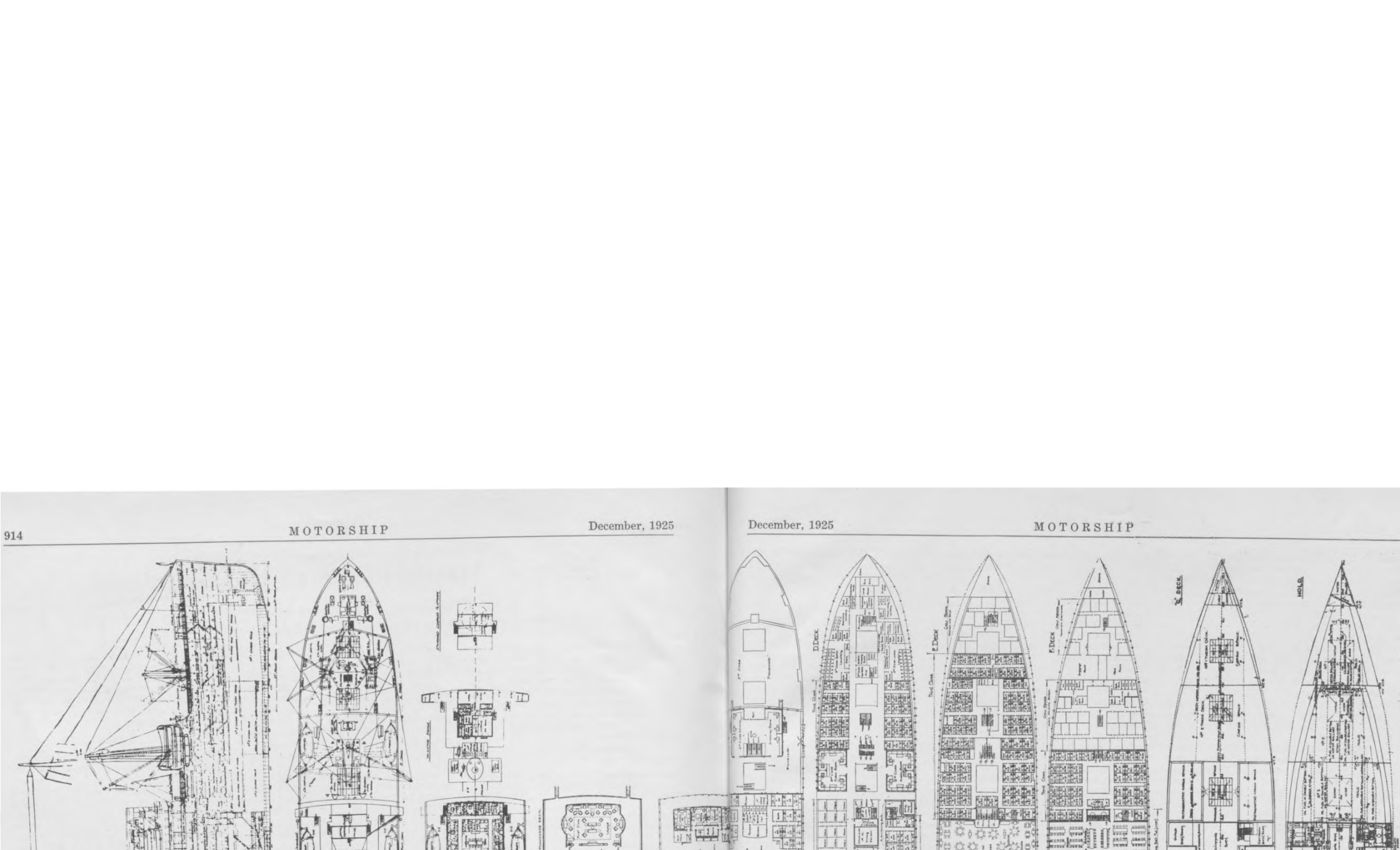
The space on F deck over No. 5 cargo hold is also devoted to 3rd class passengers, there being 26 4-berth and 14 2-berth cabins in this compartment. A power operated watertight door in the forward bulkhead of this compartment permits access to the dining room, whilst a similar door in the after bulkhead gives access to a further batch of 3rd class accommodation situated over No. 6 hold and consisting of 19 4-berth cabins and 13 2-berth cabins.

E Deck

At the forward end of E deck are situated 12 4-berth cabins forming the quarters for seamen and boys. Aft of these in the 'tween decks immediately over Nos. 1, 2 and 3 holds the space is given over to 3rd class passengers, 300 passengers being accommodated in 65 4-berth cabins and 20 2-berth cabins. Accommodation for 4 stewardesses is also provided in these compartments

Immediately abaft this accommodation is situated the 1st class dining room in which accommodation is provided at a number of small tables for a total of 142 persons. At the after end of the dining room is situated a service passage and service room, abaft which are the kitchens, bakery, confectioner's shop, vegetable room, kitchen scullery and kitchen larder.

In the spaces at the sides of the engine hatch as far as the after engine room are situated 2nd class pantry, 2nd class scullery,



butcher's shop, bread room, 1st and 2nd class cold pantry, 2nd class still room and the service passages leading from the kitchen to the 2nd class dining room which occupies the 'tween deck space directly over No. 4 hold.

The 2nd class dining room, which is fitted with a number of small tables, each capable of seating from 4 to 8 passengers, has a total seating capacity of 242 persons.

From the after end of the 2nd class dining room to the after peak bulkhead this deck is given over to 3rd class passenger accommodation, there being 48 4-berth cabins and 12 2-berth cabins, with two additional 2-berth cabins for stewardesses. Abaft the after peak bulkhead are quarters for the stewards, cooks, pantry men, boys, etc., 80 in number, berthed in separate rooms containing either two or four berths, special bathrooms, toilets, etc., being provided for their exclusive use.

D Deck

In the space forward of the fore peak bulkhead on D deck are situated the carpenters' shop, joiners' shop, lamp room, paint room and a general store. In the 'tween decks over the forward end of No. 1 hold on the starboard side are situated three 2-berth cabins for quartermasters together with a motormen's toilet and bathroom and on the port side a kitchen boys' and longshoremen's toilet, and a similar compartment with bathroom for seamen's use. Near the centerline, space has been conveniently found for a plumber's shop.

Over the after portion of the length occupied by No. 1 hold, the starboard side is exclusively devoted to a 3rd class women's toilet and bathrooms, the corresponding space on the port side being similarly equipped for 3rd class male passengers. In the central portion of this compartment are the 3rd class barber shop, a room for pressing clothes and a 3rd class ladies' drying room.

Over No. 2 hold are arranged 22 4-berth cabins and 12 2-berth cabins for 3rd class passengers, immediately abaft which are two 3rd class public rooms fitted with settees, tables, piano, etc.

For the length of the Aquasanium and engine room compartments the port side of

this deck is utilized for the provision of accommodation for carpenters, boatswains, joiners, printers, band-masters, musicians, clerks and other miscellaneous members of the complement, for messrooms for seamen, motormen, petty officers, stewards and waiters, and for quarters for the chef, cooks, pantrymen, storekeepers, etc.

Over the corresponding length on the starboard side staterooms are provided for 2nd class passengers, 84 in number, there being six 2- or 3-berth, 15 4-berth and one 6-berth staterooms, together with cabins for four stewardesses and a chief steward. These 2nd class staterooms are arranged to be readily interchangeable with the 3rd class accommodation.

On the center line are arranged printing room, photographic dark room, shoe room, blanket and linen stores, and 2nd class toilets, petty officers' toilet and bathroom, musicians gallery and 3rd class dining room entrance.

Abaft the machinery compartments on the port side of this deck are situated the engineers' messroom, pantry, cabins, toilet and bathroom, whilst immediately abaft of these is the hospital accommodation, consisting of a men's hospital with six berths, women's hospital with four berths and a maternity bed, operating room and dispensary, two bathrooms and stateroom for one nurse.

On the starboard side are arranged 16 4-berth and 10 2- or 3-berth cabins for 2nd class passengers and immediately abaft is a 3rd class public room, fitted similarly to those forward and containing a piano. Immediately abaft the public room is an electrician's workshop and a cabin for a chief steward.

The center portion between the hatches provides accommodation for another 3rd class barber shop, stewards' store, stewardesses' sitting room, 2nd class stairway, 3rd class entrances, linen room, toilets, bathrooms, etc.

Steering Gear

In a deck house aft on D deck are situated the hydro-electric steering gear, men's and women's toilets for 3rd class passengers, bathroom and ladies' drying room.

The steering gear is of the electric hydraulic Hele-Shaw Martineau type manufactured by J. Hastie & Co., and consists of a double-ended steel tiller on the rudder stock operated by four rams working in hydraulic cylinders. Two patent Hele-Shaw pumps are provided, driven by electric motors supplied by the Swedish "General Electric Co." The gear is controlled from the bridge by a telemotor of the McTaggart, Scott & Co.'s make, complete with charging tank, pumps, etc., and can also be operated from the docking bridge aft by mechanical gear.

At either side of the deckhouse containing the steering gear are fitted two electric warping capstans similar to those fitted on the forward end of C deck and described in the next paragraph. The spaces at the after end of D deck on either side and at the after end of the after deckhouse, are assigned as a promenade space for 3rd class passengers.

C Deck, Windlass and Capstans

At the fore end of C deck is fitted the gear for working the anchors and cables, the cables passing out of the hawse pipes at this deck, over cable stoppers to the electrically driven windlass.

The windlass, manufactured by Napier Brothers, is of the latest electrical type with cable holders designed for working 3 in. stud link cable. Two quick warping ends are fitted, together with the necessary levers for working the gear by hand. Automatic self-holding brakes enable the veering of the cable to be controlled. Two electric motors, by the Swedish "General Electric Co." are fitted complete with solenoid brake, control gear, slip clutches and all necessary electrical gear.

Aft of the windlass, on both sides, is fitted an electrical warping capstan, of Napier Brothers' make, capable of exerting a pull of 15 tons at 50 ft. per min. These capstans are driven through spur and bevel gear by electrical motors situated on this deck, the motors being of the Swedish "General Electric Co's." make.

Abaft the capstans is fitted a breakwater, and immediately abaft of this is situated No. 1 cargo hatch. No 2 cargo hatch is situated on this deck just forward of the bulkhead forming the forward boundry of the 3rd class entrance and promenade space.

Abaft of this bulkhead and occupying the larger portion of the space between No. 2 and No. 3 cargo hatches is a larger deckhouse for 3rd class passengers, intended for use as a smoking room.

At either side of this deckhouse and as far aft as the after end of No. 3 hatch the deck space will serve as a 3rd class promenade, this space being enclosed by B deck overhead, but provided with large "tonnage" openings on either side.

The transverse bulkhead forming the after boundary of the 3rd class promenade space divides it from a space devoted to 1st class single-berth staterooms, each fitted with a Pullman berth for the accommodation of an extra passenger when required, and comprising also the cabins for the doctor, purser and chief steward. The purser's office is arranged on the center line in this space and furnished with a safe, stenographer's desk and other usual fittings.

The next batch of cabins, containing 36 berths, are arranged to be interchangeable for either 1st or 2nd class passengers and consist of 10 2-berth and four 4-berth staterooms. The remainder of the space under the bridge is mainly devoted to 2nd class accommodation, berths being provided for some 304 passengers in 67 4-berth and twelve 2- or 3-berth cabins.

In the center line of the ship are fitted the necessary stairways, ladies' and gentlemens' bathrooms and toilets, 2nd class barber shop, with a portion curtained off for the use of ladies, and an electrical bathroom, linen room and 1st class shoe room; whilst space is also found in suitable positions for the doctor's consulting room and waiting room, and berths for the linenkeeper, leading stewards and stewardesses.

The after end of the bridge space is divided by a centerline bulkhead into two large compartments, each about 16 ft. long by 21 ft. broad, that on the port side being elaborately fitted out for use as a children's room for 2nd class passengers whilst the starboard compartment will be used as a 2nd class gymnasium.

The open deck space abaft the bridge will be utilized as a 3rd class promenade. On the center line in this open space is situated No. 6 cargo hatch and abaft it a deckhouse intended to serve as another 3rd class smoking room.

B Deck

The forward end of the bridge deck for about 60 feet. is set aside as 3rd class promenade, the forward boundry being formed by a bulwark and the after end by a solid bulkhead fitted with windows, supporting the promenade deck.

Abaft of the bulkhead, for the full length of the bridge deck, is a deckhouse having a promenade about 12 ft. wide on each outboard side, reserved for the use of 2nd class passengers.

At the forward end of the deckhouse is installed the regal suite consisting of sitting room, bedroom with two berths, bathrooms and toilet, and baggage room. The rooms of this regal suite are situated on the center line and have on either side a cabine-de-luxe, each with two beds, private bathroom and baggage room.

Immediately abaft this is the 1st class entrance, with stairway leading to the deck below and to the promenade deck above, worked round the central passenger elevator by means of which passengers can be conveyed to any of the 1st class accommodations lying between the promenade deck and the swimming bath gallery.

Along each side of the deckhouse are arranged 1st class staterooms, six on either side having private bathrooms, whilst the remaining eight are fitted with a single bed, with a Pullman berth, capable of being brought into use during the busy season.

The center portion of the deckhouse, clear of the funnel uptakes and engine hatch, is devoted to toilets, bathrooms, 1st class barber shop (with special section reserved for the use of ladies) baggage room, linen room, and a cabin for 2 stewardesses.

The midship portion of the deckhouse is given over to the 2nd class lounge extending from side to side with a dome over, and opening aft to the 2nd class vestibule—with staircase leading down to the various decks below—2nd class writing room, 2nd class reading room, bookstand and shop. The remainder of the deckhouse is utilized as a spacious 2nd class smoking room, with a large dome over. A small deckhouse built on the island deck aft, contains an isolation hospital for males containing five berths, with its own bathroom and toilet; similar accommodation is also provided for the use of female infectious cases.

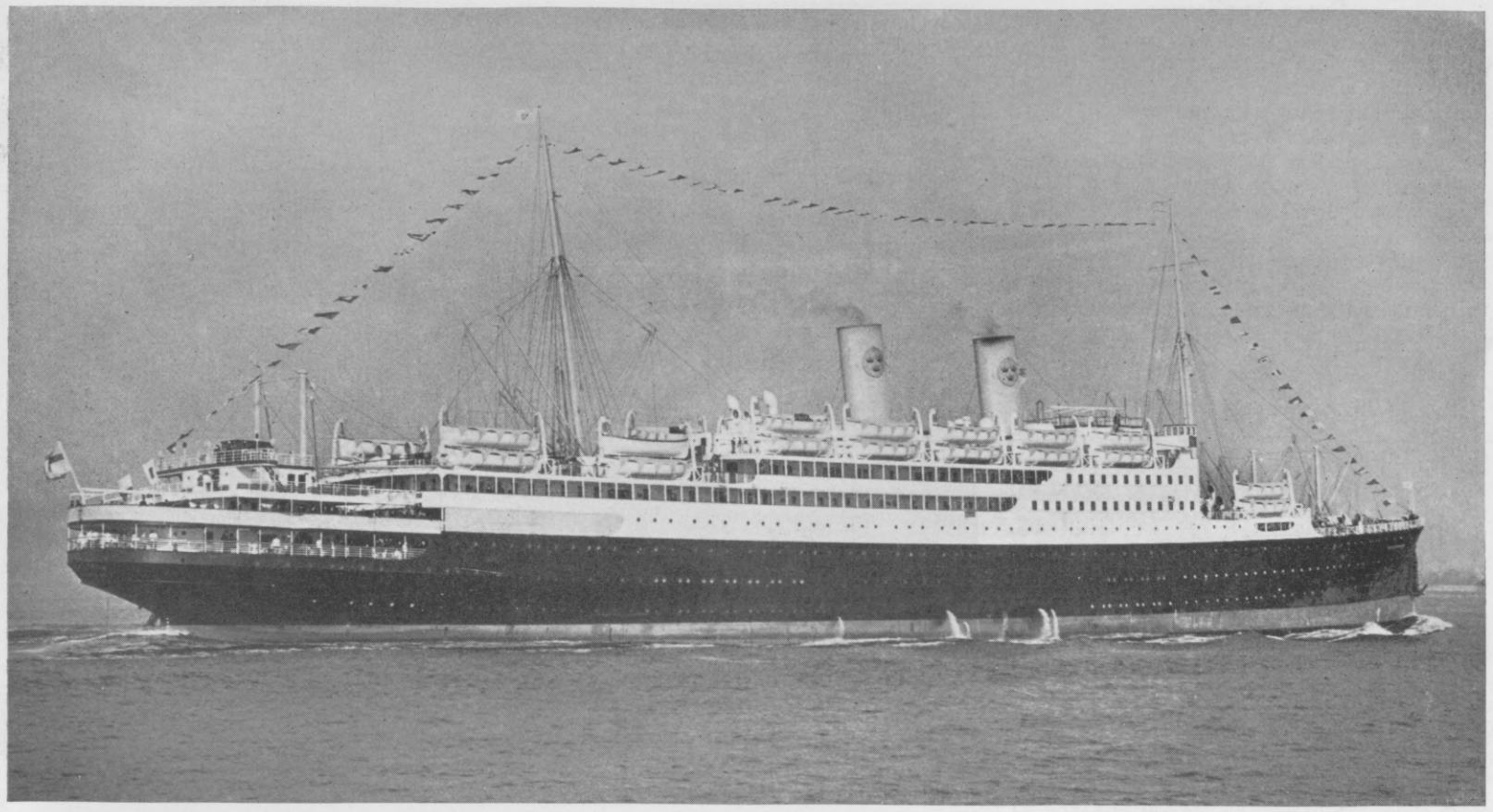
A Deck

The major portion of this deck is utilized as a 1st class promenade space.

Across the fore end of this deck and for a distance aft of about 70 ft. on each side the promenade space is enclosed with a screen bulkhead fitted with Laycock's patent frameless light and window lift, 36 in. x 22 in. clear opening. The space within this screen bulkhead constitutes a spacious covered promenade and observation station.

A deckhouse 190 ft. and 40 ft. wide is built on the forward end of this deck, having at its forward end a first class lounge and music room, fitted with a bow window on both sides.

Aft of it is the 1st class vestibule containing stairway and elevator, bookstand and pantry. Double doors at either side of the forward bulkhead give entrance to the



Gripsholm has unusually commodious deck spaces for all classes of passengers, including enclosed decks for 1st and 2nd classes

lounge and music room, whilst similar doors at the after end of the vestibule give access to the 1st class library, reading and writing room, built round the forward funnel uptake, this room being fitted with bow windows similar to the music room.

The 1st class gallery and 1st class gymnasium carry this house along to the forward end of the engine hatch. From the gallery, short passageways lead to the 1st class smoking room which has two bay windows on either side. The after end of the deckhouse is fitted out for use as a verandah cafe.

No. 4 and No. 5 cargo hatches are on this deck. At the extreme end of the vessel and forming the roof of the isolation hospitals, is a docking bridge with wings. The wheel for mechanically controlling the steering gear is mounted on this bridge in a suitable wheelhouse.

Boat Deck

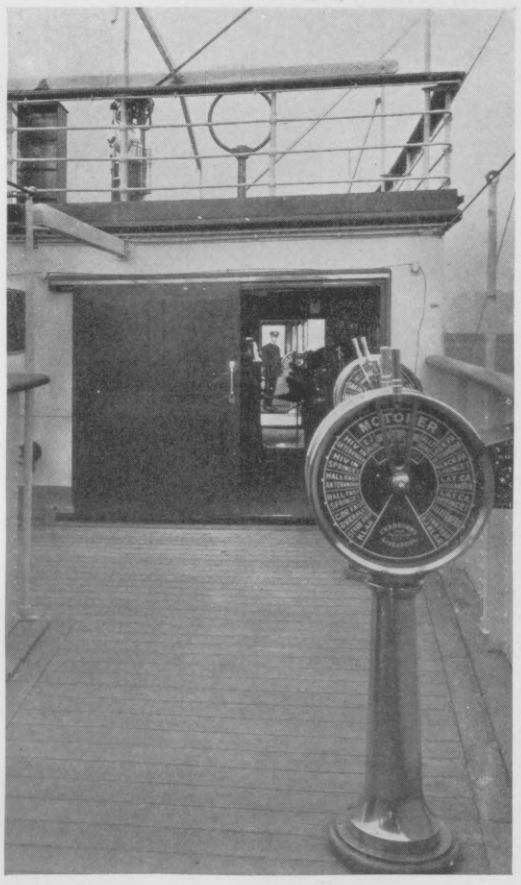
This deck, though utilized for carrying a large portion of the lifeboat outfit, has room for deckhouses for the accommodation of ship's officers and other purposes.

The deckhouse under the navigation bridge contains the officers' messroom with pantry, 11 officers' cabins, bathroom and lavatory and gyro-compass room. On both sides of each funnel uptake are houses containing the mufflers for the main engines. At the after end of this deck is the engineers' smoking room and the radio office.

An engineer's elevator, fitted near the engineer's smoking room, permits of rapid transit down to the engineers' quarters. On this deck are also situated the emergency dynamo room, the skylight domes of the lounge, gymnasium and smoke room and the engine room skylignt.

On the navigating bridge are installed the captain's quarters, comprising day cabin, bedroom, bathroom and toilet, captain's chartroom and ship's chartroom. The forward portion of this house forms a shelter for the steering wheel and navigating instruments.

The navigating bridge is extended on both sides to the full width of the vessel, wing shelters being fitted at either end. The roof of the captain's quarters forms the standard compass platform.



Looking across the bridge from wing to wing with wheelhouse doors open

The Sperry gyropilot has not yet been installed, but a radio direction finder, fire detection board, Stone watertight door indicator, electric master clock controlling 11 clocks in the public rooms, helm indicator, engine revolution indicator and loud speaking telephones are included in the equipment.

Passenger Accommodation

When the ship is carrying the normal number of passengers, 91 berths will be available for 1st class passengers, including the regal suite and cabines-de-luxe. By the use of Pullman berths a number of single- and double-berth cabins can be converted into double and 3-berth staterooms thereby raising the number of 1st class berths to 129. The normal number of 2nd class berths is 355. By the addition of Pullman berths this number can be increased to 482. Berthing accommodation is provided for 1006 3rd class passengers. When booked to its maximum capacity therefore the vessel will carry 1617 passengers. Accommodation is also provided for a crew of 320 officers and men, making the total population of the vessel 1937.

Life Saving Appliances

There are 30 lifeboats 30 ft. long and two 30 ft. motorboats carried on 16 sets of Welin davits. Of these 18 lifeboats and two motorboats are carried on the boat deck, eight lifeboats on the after end of the promenade deck and four lifeboats on the forward end of the bridge deck. This number of boats is sufficient for the total population of the vessel.

For the rapid handling of the boats four electrically driven worm-gear boat winches of Clarke Chapman & Co.'s make are fitted on the boat deck, each winch being capable of lifting a load of 1½ tons at a speed of 120 ft. per min.

Cargo Appliances

Four 3-ton steel tube derricks are provided for working each hatch, with one 20-ton derrick additional for No. 3 hatch. The wing derricks have an outreach of 8 ft. beyond the line of the ship's side. For working the derricks, ten 3-ton and two 5-ton electrical winches have been supplied by the Swedish "General Electric Co." The 5-ton winches are capable of lifting 5 tons at 80 ft. per min. and 2 tons at 200 ft. per min., whilst the 3-ton winches can hoist 3 tons at 120 ft. per min. and 1½ tons at 240 ft. per min.

Electric Elevators

Five electric elevators are provided, namely—

No. 1 Engineers' elevator, from store on G deck to smokeroom on boat deck.

No. 2 Store elevator, from G deck to C deck.

No. 3 Pantry elevator, from F deck to E deck.

No. 4 1st Class and mess service elevator, from E deck to boat beck.

No. 5 Passenger elevator 1st class, from swimming pool balcony to A deck.

Watertight Door Installation

Watertight doors below the bulkhead deck can be operated by Stone's hydraulic system controlled from the bridge. The power for the hydraulic system is given by a motor driven pump, with a reserve power accumulator sufficient to close all doors twice should the pump be out of action.

Heating and Ventilating

A complete installation for heating and ventilating the passenger accommodation on the Thermo-tank principle are provided.

Half of engineers' smokeroom on boat deck, showing elevator entrance in lobby

The installation includes the latest type of fittings for ventilating public rooms, staterooms, cabins, passages, etc., for all three passenger classes, a supply being provided for each berth in the 1st and 2nd class staterooms and general supplies for the 3rd class cabins.

The 1st class staterooms, in addition to the Thermo-tank heating can be heated electrically, one electric heater being fitted in each room.

Decoration of Public Rooms

For the 1st class smoking room inspiration has been had from the Astraksalen at Grispsholm Castle. The paneling is of silver oak, and the casement windows have leaded lights. Blue leather has been used for the upholstery. A carved stone chimney piece is worked into this room.

A late 18th century period is the theme of the decoration in the 1st class reading and writing room, paneled in grey sycamore, embellished with gilt, with old rose silk damask draperies and Beauvais tapestry covered furniture. In this room the carved chimney piece is of white marble.

The 1st class lounge represents an earlier period of the 18th century, introduced into Sweden during the reign of Gustavus III. Feather grained mahogany paneling is enriched with gilt ornamentations, and the marble chimney piece with ormolu gilt mounts has a mirror above. Furniture and piano console are of mahogany, and a savonnerie carpet covers the floor.

Empire style has been selected for the 1st class dining room, painted old ivory with gilt ornaments in the frieze and panels.

Throughout the 2nd class public rooms paneling is found and the decorations are relatively sumptuous. The dining room is in a late 18th century style with biscuit colored paneling, relieved with pilasters having white bas relief ornament on a blue ground and cameos of pale blue. The smoking room has been based on the Hertig Karle Kammare at Gripsholm Castle; the reading room has been inspired by the Hertig Karls Formak, originally in Rydaholm Castle at Uppland and transferred to Gripsholm; and the lounge decorations are after the Rikssalen at Gripsholm Castle.

Promenade deck, 1st class, enclosed for 70 ft. at forward end

Auxiliary Engine Room of the Gripsholm

A Compact Plant of 3750 b.hp. Supplies Air for Engines and Electric Power for the Ship

A DISTINCTIVE character is imparted to the auxiliary power installation of the motorship GRIPSHOLM by the presence of three large Diesel-driven injection and starting air compressors in addition to the three Diesel-driven generating sets. The usual bilge, fire, and sanitary pumps are also included.

All the auxiliary Diesel engines are 4-cycle single-acting with trunk pistons, and their general structure is of standard Burmeister & Wain practice. Vibration has been reduced to a degree fully compatible with the requirements of high-grade passenger service by the fitting of balance weights. Like the main engines, their cylinders are cooled with fresh water and their pistons with oil. The auxiliary engine room therefore also contains the necessary lubricating oil and fresh water coolers.

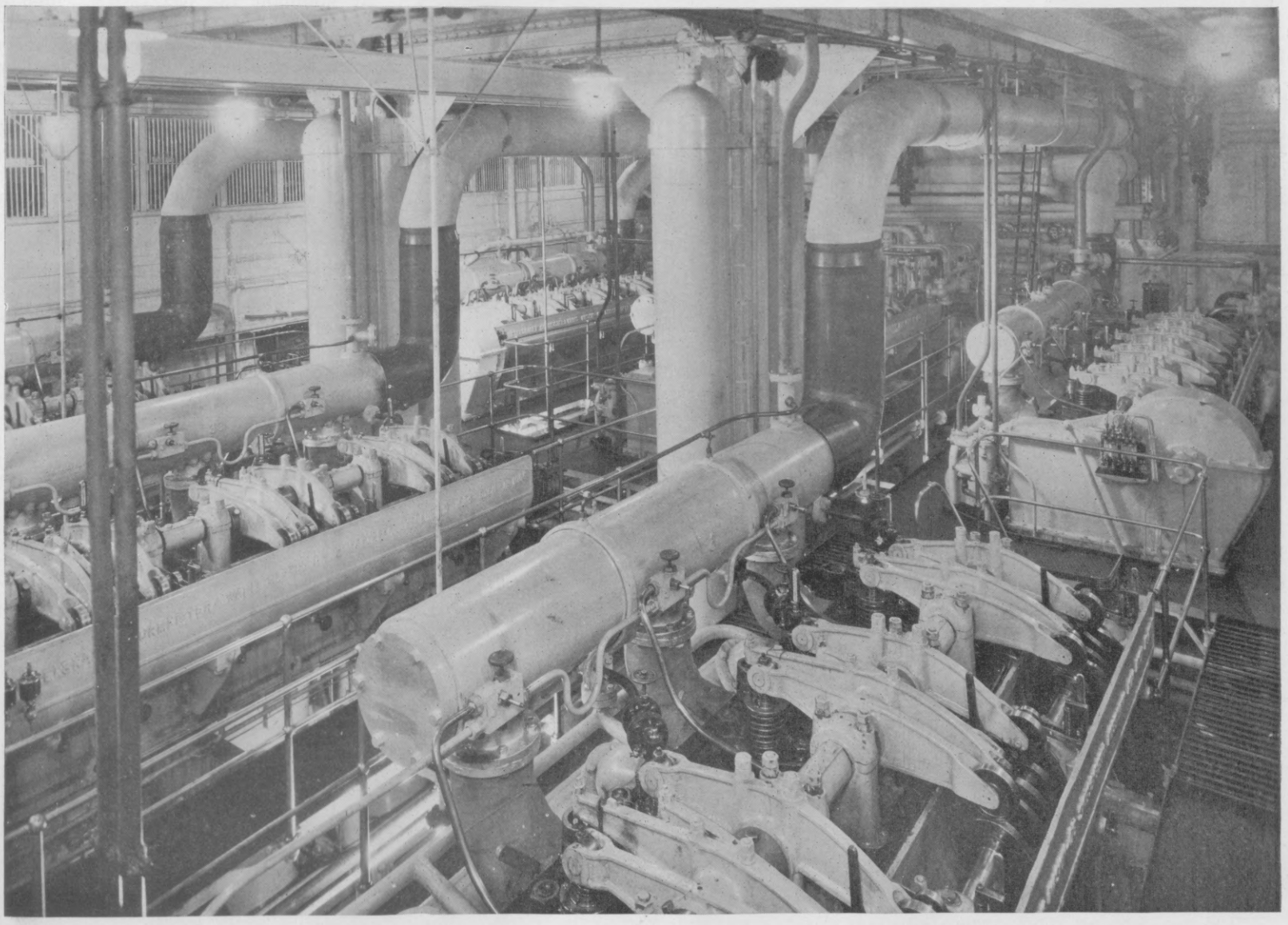
Two of the three generating sets are sufficient to carry the normal load at sea during maneuvers and while in port, the remaining one being held as a standby. On the voyage across the Atlantic the average load was 800 amp. at 220 volts on each machine, making a total of 1600 amperes. The auxiliary Diesel engines had an average daily consumption of 10.4 tons of fuel oil.

The generating and compressing sets are arranged side by side across the width of the engine room, with center lines fore and aft. They therefore form a group in the center of the engine room floor, and although they are spaced close enough together to permit the arranging of miscellaneous auxiliary equipment all around them, enough room has been left between them to prevent any interference with operation and maintenance work. Gratings located at a convenient height below the engine camshafts, and interspersed with frequent ladders to the engine room floor below, form a continuous upper operating platform.

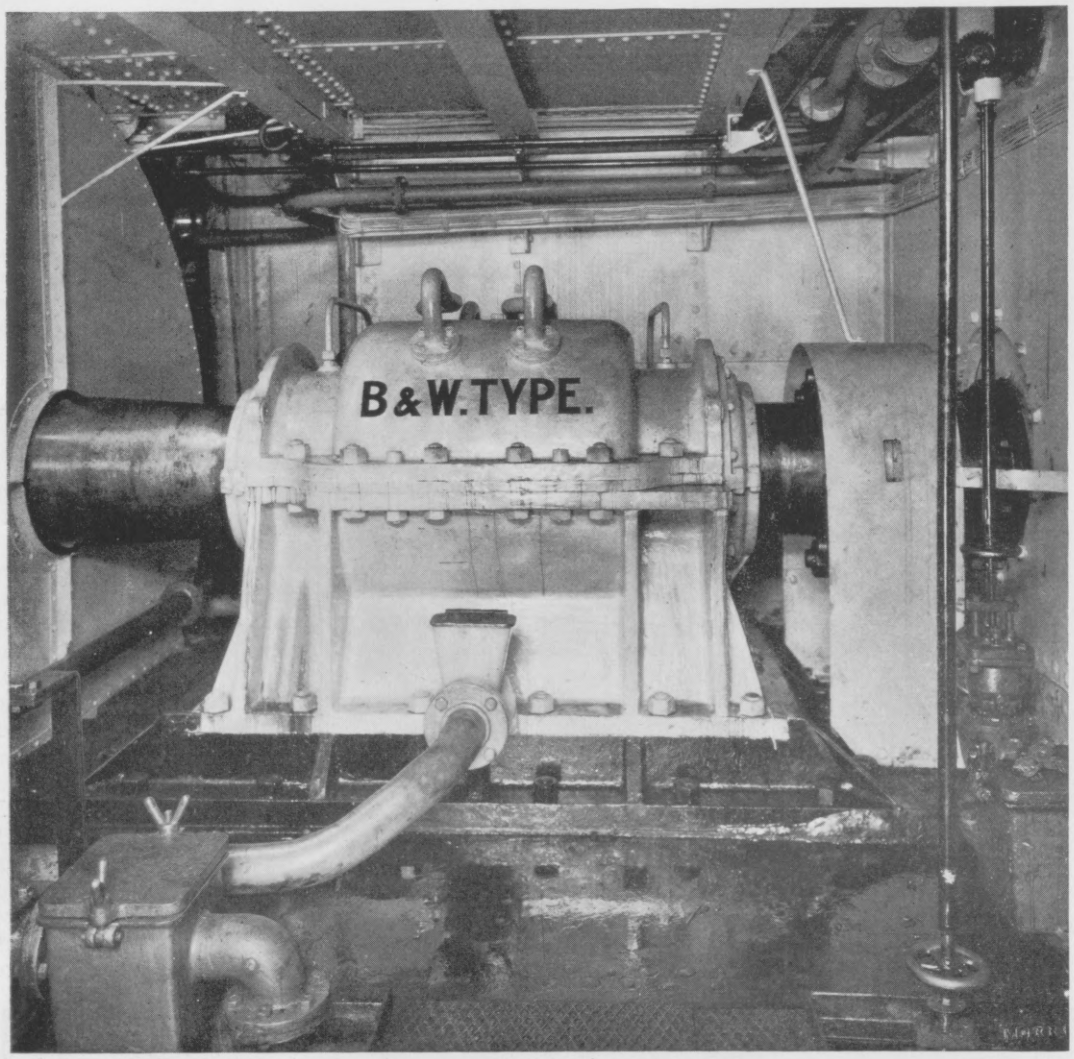
Close under E deck is the long switchboard running parallel to the main engine room bulkhead and situated about six feet away from it. The F deck is continued in from the outer shell of the ship at the level of the switchboard platform far enough to produce a roomy workshop on the port side, while CO_2 refrigerating machinery and stores are installed on the starboard portion of the F deck. Underneath these deck projections and next to the engine groups are located miscellaneous items such as port and starboard pairs of maneuvering tanks, fuel oil deep tank, and various pumps.

At the forward end of the auxiliary engine compartment is the boiler room, flanked by two fuel oil bunkers of large capacity. Pumps, condenser, feed and filter tank as well as their other accessories are grouped about the boilers. Leading up from the boiler room is the shaft for the funnel uptake, running parallel to the auxiliary engine room casing. Like the casing from the main engine room it is of diminutive proportions and makes no serious encroachment on the accommodations located above the generating and compressing sets. The forward stack is just above the after auxiliary engine room bulkhead and the silencers for the smaller engines are located at its base. Flues from the galley on F deck are also led up through the stack; these and the heating boiler funnel produce the smoke generally seen coming out of the stack.

One engineer, two oilers, and a wiper are normally on duty in the auxiliary engine room, but as four fairly large engines are



Three 750 b.hp. compressor sets and three 500 b.hp. generators in the auxiliary engine room. (Picture taken while two engines were operating)



Thrust blocks on the Gripsholm are of the plain collar Burmeister & Wain type

Machinery Installation of M. S. Gripsholm

MAIN ENGINE ROOM

2 Main engines, each 8,150 i.hp. at 125 r.p.m., six cylinders, cylinder diameter 33.07 in., piston stroke 59.05 in., Burmeister & Wain, double-acting type.
4 Lubricating oil pumps, each 200 tons per hr.
2 Lubricating oil coolers.
2 Fresh water cooling pumps, each 175 tons per hr.
2 Fresh water coolers.
4 Salt water cooling pumps, each 175 tons per hr., for fresh water coolers and for exhaust manifolds.
2 De Laval oil purifiers.
2 Fuel oil transfer pumps.
1 Emergency bilge pump.

AUXILIARY ENGINE ROOM

3 Diesel engines, each 750 b.hp. at 170 r.p.m., four cylinders, cylinder diameter 19.69 in., piston stroke 35.43 in., B. & W. single-acting type, direct connected with 3-stage duplex compressor 33.86 in. diameter l.p., 30.51 in. diameter i.p., 6.77 in. diameter h.p., stroke 11.02 in.
3 Diesel engines, each 500 b.hp. at 200 r.p.m., three cylinders, cylinder diameter 19.69 in., piston stroke 29.53 in., B. & W. single-acting type, direct connected with 330 kw. d.c. 220 volt generator.
4 De Laval oil purifiers.
2 Salt water cooling pumps for the auxiliary Diesel engines.
1 Air-compressor, 3-stage.
1 Emergency air-compressor (wired only to switchboard of emergency lighting set on boat deck).
2 Fuel oil transfer pumps, each 150 tons per hr.
1 Fuel oil service pump, 30 tons per hr.
1 Ballast pump (fuel oil only) 250 tons per hr.
1 Ballast pump (salt water only) 250 tons per hr.
2 Bilge pumps, each 150 tons per hr.
4 Sanitary pumps, each 200 tons per hr.
3 Fresh water pumps, each 75 tons per hr.
1 Hydraulic pump for watertight bulkhead doors.
1 Circulating pump for hot salt water.
1 Circulating pump for hot fresh water.
2 Refrigerating machines CO_2 type.
3 Brine pumps for above.

BOILER ROOM

2 Scotch boilers, each with two furnaces, oil fired; air pump, circulating pump, two feed pumps and two oil-burner supply pumps, all steam driven; evaporator; distiller; two calorifiers for hot salt water and hot fresh water respectively; electric ventilating fan.

almost too much for one man to take care of, it is expected that after the next voyage three more assistant engineers will be added to the crew. A considerable share of their work consists in looking after the piping all over the ship and in maintaining the electric motors, of which there are 75, not counting the fractional horsepower and small fan motors. In addition to lending a hand with some of this work, the extra engineers who are probably to be shipped soon, will be assigned to the three auxiliary engine room watches.

Gripsholm's Contract Trials

Early in the morning of Nov. 4th the Swedish-American motorliner GRIPSHOLM left the Tyne for trials. In a somewhat rough sea she successfully completed her program that day, and the following day the ship was accepted by the owners and the flag of Sweden hoisted.

During the night of Nov. 5-Nov. 6 GRIPSHOLM, anchored at the mouth of the Tyne, and early Nov. 6 a large party of guests from all over the world was given opportunity to inspect her and make a short trip on her. The visitors included well known people from Great Britain France, Italy and Germany as well as from the Scandinavian countries, and all were amazed to see how pretty and comfortable a ship she is. A lunch presided over by Mr. Axel Carlander, the director of the Swedish company, was given on board, and the guests were landed in the afternoon.

At midnight the GRIPSHOLM sailed on her maiden passage to her home port, Gothenburg, where she arrived at noon, Sunday, Nov. 8, greeted by the whole city.

The engines, designed to run normally at 110 revolutions and give the ship, loaded, a speed of 16 knots, were kept at about 100 revs. for the sake of delaying the arrival at Gothenburg to an hour suitable for a Sunday, but during the trials the contract speed of the engines, as well as of the ship, was easily attained and surpassed.

Gripsholm Power and Speed Trials

Nov. 5, 1925

RUN NO.	SPEED KNOTS	INDICATED HORSE-POWER	SHAFT HORSE-POWER	REVS. PER MIN.
1	17.76	18,020	14,200	131.0
2	18.23	17,210	13,800	130.5
mean	17.99	17,115	14,000	130.8
3	17.53	17,060	13,600	131.5
4	17.68	17,580	13,910	130.5
mean	17.6	17,320	13,755	131.0
5	14.65	11,650	8,500	110.2
6	16.56	12,050	8.560	111.2
mean	15.60	11,850	8,530	110.7
7	10.54	5,270	3,100	79.1
8	12.45	5,990	3,220	80.7
mean	11.49	5,630	3,160	79.9
Astern No. 1	...	...	6,080	95.0
2	...	...	9,640	110.0

Data Observed on Maiden Passage

PRESSURES (mean of several observations)

Injection air .....780 lb. per sq. in.
Starting air .....370 lb. per sq. in.
Cooling oil ..... 18 lb. per sq. in.
Lubricating oil ..... 10 lb. per sq. in.
Fresh cooling water..... 23 lb. per sq. in.

TEMPERATURES (mean of several observations)

Cooling oil, supply .....104 deg. F.
" " , discharge .....117 deg. F.
Fresh cooling water, supply..... 79 deg. F.
" " " , discharge...115 deg. F.

Maneuvering the Gripsholm's Big Engines

Impressions Gathered in the Engine Room While the Liner Was Passing Up the Crowded River

By Julius Kuttner*

FOR the purpose of getting a first-hand impression of the GRIPSHOLM'S engines' maneuvering qualities I boarded the liner just before she heaved anchor at Quarantine in New York Harbor on the morning of November 30. The fact that I was readily admitted to the engine room at once indicated the probable answer to the questions which had no doubt been raised in many minds:

How would the big 8000 i.hp. engines respond to the orders from the bridge?

Would the double-acting machinery require a maneuvering technique different from that which long years of operating single-acting cargo motorships have reduced to a matter of routine?

Would the record-breaking size of her pistons, rods, and crossheads have a noticeable effect on the promptness of response to the movements of the handling and reverse gear?

On her way up the crowded river to her berth at Pier 97, North River, there would be plenty of maneuvers to carry out and give a searching test of the double-acting Diesel's performance.

Quarantine anchorage was crowded on that Monday morning, with the giant LEVIATHAN, MINNEWASKA, DEUTSCHLAND, ARAGUAYA, and half a dozen other big vessels waiting to go up to their piers. There was a procession all the way up from Quarantine and, with heavy ferry traffic and numerous tows in the river, the pilot had to give many orders from the bridge.

A few minutes after the anchor had been heaved at Quarantine, Mr. Boldt, chief engineer of the Burmeister & Wain Works, led me down into the engine room.

Not much is to be seen on the top grating except the push rods and valve levers surmounting the row of upper cylinder heads. The bareness of this part of the engine room is striking, giving an impression of great size because it is not obscured by the piping and gear generally found in engine rooms. The tops of the two engines therefore stand out prominently, and the great size of all the parts on them instantly makes it plain that here is the biggest and proudest thing that has ever been done with Diesel engines.

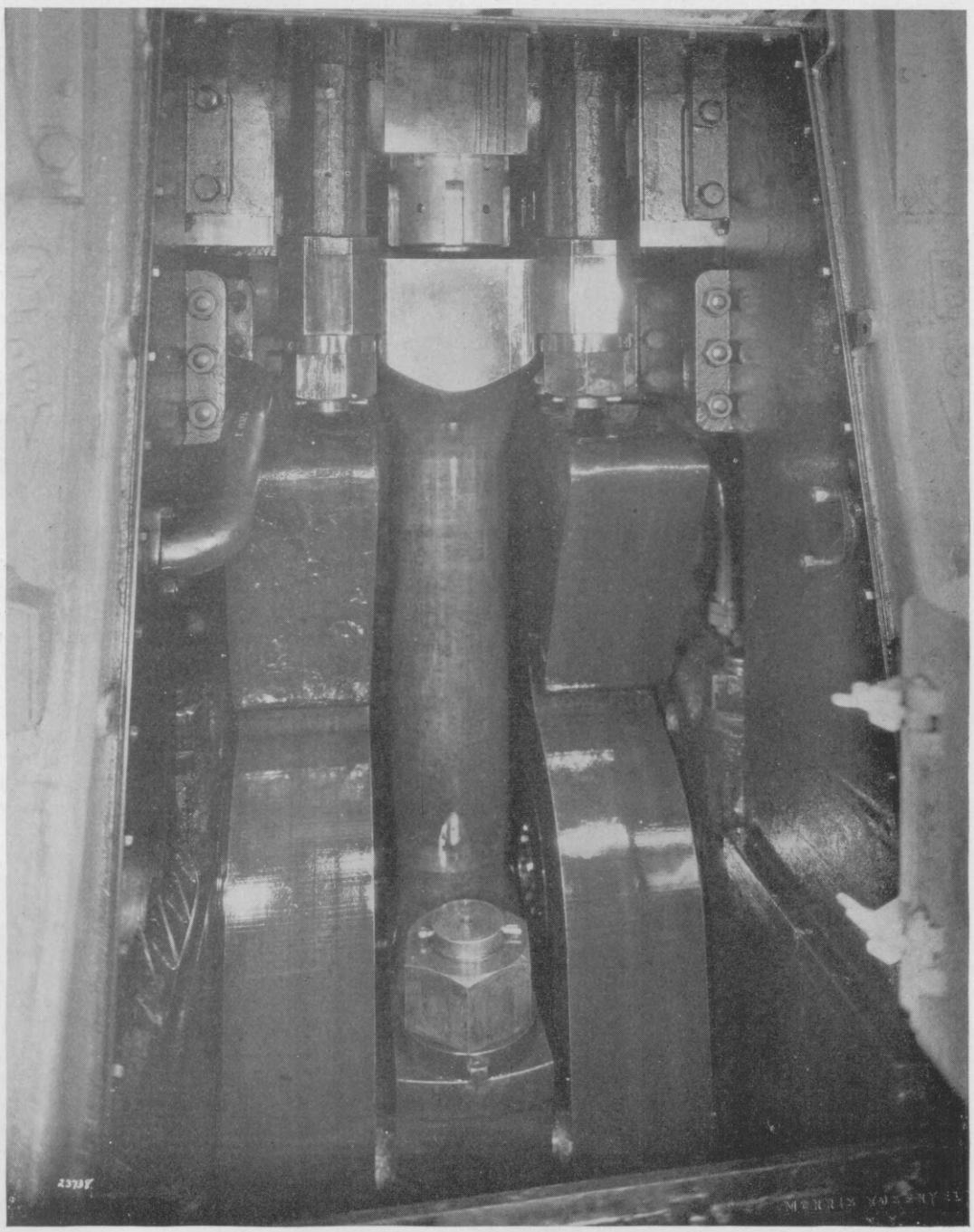
The space between the top grating and the one below it at first gives a bewildering impression of cams, cam rollers, guide links, shafts, and push rods. Extending upward, the four rods to each cylinder actuate the top-end valves while a similar number of rods go to the next grating below where the valves on the lower cylinder heads are located. However, because each cam operates both a top-side valve and the corresponding one for the bottom-side, the number of cams is the same as for a single-acting engine. Only the rollers, guide-links, guide-link shafts and push rods are duplicated.

Considering that something like 3600 valve events per minute were occurring in this space, the silence and smoothness with which this machinery was operating was nothing short of remarkable. Exhaust valves of about 13 in. diameter were being thrust open against more than three tons pressure each, at the rate of more than 1200 per minute.

On the third grating downward the lower cylinder heads with their fuel, starting, exhaust and inlet valves came into sight. Located right out in the open, their rhythmic working could be plainly seen. It was particularly interesting to watch the fuel valve, with its quick, precise stroke of something like three-eighths of an inch.

This part of the machine resembles nothing so much as a horizontal engine and possesses many of the points of advantage claimed for the horizontal arrangement. The fuel and starting valves having only a slight upward slant, their removal and replacement apparently can be made at least as conveniently as on a horizontal machine. Surely no more valve gear needs to be disconnected for that purpose than is the case with the corresponding valves on the top side.

From the third or lowermost grating on which I was now standing I could see the engineers on watch grouped about the maneuvering stands. Their faces were attentive, but showed no trace of worry. A moment later Mr. Boldt had led me down to the engine room floor and, with all the power that his voice could command, intro-



Rod of 13½ in. diameter, double center cross head and balance weights

*Associate Editor of MOTORSHIP and licensed chief engineer.

duced me to Mr. Thorell, the chief engineer.

The attempt to speak brought home to me the fact that the lower part of the engine room was pervaded with a deafening noise of some kind, but for a moment I could not tell what it was or where it was coming from. Then I looked up and saw the two massive curving exhaust headers running along about on the level of the grating above. There were two of them, one from each engine, and they were conveying away about 600 charges of exhaust gas per minute, shooting out of 13-inch exhaust valves at about 50 lb. pressure. That was the noise.

Later on I found that it is possible for a man to crawl into the cylinders through the hole for the exhaust valve. Mr. Thorell expects to use this method of checking up one or two cylinders before starting the return voyage, but he is making this inspection merely as a matter of routine, and were it not for the necessity of taking on fuel he would be ready to take the ship back across the Atlantic again at 20 minutes' notice.

Mr. Thorell was cordial in welcoming the representative of MOTORSHIP, and although I expected he would be much too busy at such a time to make any but the most necessary conversation, there actually was no constraint in his manner. He complained about the bars in the first-class gymnasium, which he said had required the attention of his engineers. Trouble with the engines? Why! the throttle levers of both engines had been left in the same notches from the time they left Gothenburg harbor until they sighted Nantucket Shoals lightship, after which they had slowed down in order not to reach Quarantine too early.

The general appearance of the engine room gave evidence in support of this. Everything had that settled-down appearance characteristic of an installation which has not been disturbed for overhaul purposes over a considerable period of time.

I had just finished talking to the Chief when the starboard telegraph began to jangle. It was still ringing when the port telegraph started in and joined its clamor to that already going on.

Standing at the forward end of the engine room, I could not see what the signal read, but as the second assistant answered it I could tell from the position of the handle that it was "Stop." An instant later the clanging of the signal bells began again and I could see the maneuvering levers being pulled back into the starting position. From the position where I stood I could only see the lever of the Aspinall governor begin to wave to and fro, and, although the movement of the control handle from the air starting to the fuel position was plainly visible, there was nothing apparent from the sound of the engine other than the beginning of the exhaust blasts to indicate that she had begun to fire on fuel.

Convinced now that I must be missing something, I looked for some way of getting to the next grating further up without crossing in front of the maneuvering stands with the engineers grouped about them. I therefore went on the outboard side of the starboard engine, and at the after end I found a place where I could pull myself up to the grating. It was now necessary for me to go forward again in order to be able to get to the inboard side.

It was then that I got my first glimpse of the piston rods, which are in plain sight from the outboard side. What I was really looking at, of course, were the cast iron tubes surrounding the rods; they had a mirror-like polish, and the oil on them was as clear as though it had just been drawn from the barrel. I was so engrossed by the sight that I let bells be bells and watched the shiny columns as they glided rapidly up and down.

As far as I could judge, the engine was then running at close to full power, but I could detect no trace of smoke or leakage around the gland. A small drain tube attached to what appeared to be the gland follower gave out a puff of gas or air apparently quite clear of smoke at each firing impulse: to judge by the sound, its pressure could not have been much above 5 lb. per sq. in.

As I continued to watch, it occurred to me that at least a part of the good working of these much-discussed stuffing boxes must be due to the cast-iron sleeve, which is rigidly attached only at a point far up inside the piston. As this joint is gas-tight against the pressure of the combustion space, the inside of the cast-iron tube is really nothing more than an elongation of hollow piston space, in which the actual piston is more or less free to find its own alignment independently of the guiding effect of the stuffing box. Conversely, also, the gland is protected against cramping and can be fitted around the sleeve with far greater accuracy than would be the case if a certain amount of side-play in the heavy crosshead had to be fully allowed for.

I reached in and put my fingers on the polished surface of the sleeve as it continued to glide up and down. It was barely lukewarm, and instead of experiencing any discomfort I found that I could have kept my fingers there indefinitely.

Soon afterwards the two engine telegraphs began to renew their clamor, and, keeping on the grating above the engine room floor, I passed around to the inboard side so as to be able to watch the valves on the lower cylinder heads.

At the signal for "Stop" the push rods could be seen to swing out in response to the withdrawal of the cam rollers by the rotation of the guide-link shafts to mid-position. At the next signal the push rods first went back into place and a moment later a slight clanking marked the thrusting home of the starting cam rollers. Air admitted to the chambers on the starting valves via the drilled spindle takes up the slack between the roller and the cam, which is sufficient to clear the cam tops so long as no starting air is turned on.

Instantly the engine began to respond, and the particular starting valve that I was watching made only two thrusts before the maneuvering lever was shifted to fuel. At the very next turn over there was an ignition in that cylinder, and the engine continued to revolve on fuel as smoothly as though no shift had taken place.

During the rest of the maneuvers executed before docking I went to the upper gratings, and everywhere I found the same unhesitating precision of the valve shifting operations. Outside of the men at the maneuvering stand there was only one man watching the upper gratings, but it did not seem as though there was much for him to do or watch.

Shortly after I returned to the main engines the signal "Finished with Engines" was rung down, and I learned that the ship had been made fast to the dock. The engine room log showed that the starboard engine had responded to 55 bells, while the port machine had executed 61 maneuvers. Bells coming in at the rate of practically one a minute seemed to be a commonplace in the handling of these remarkable units.

Log of Bells Received

m.s. Gripsholm

Engine Room 11-30-25

Quarantine, N. Y., to Pier 97, N. R.

PORT ENGINE		STARBOARD ENGINE	
Counter 1,822,488		Counter 1,772,045	
Standby, 8.55 a. m.			
Hour	Dial	Hour	Dial
9.30	slow ahead	9.30	slow ahead
9.32	half ahead	9.32	half ahead
9.33	full ahead	9.33	full ahead
9.34	slow ahead	9.34	slow ahead
9.37	stop	9.37	stop
9.38	full astern	9.38	full astern
9.43	stop	9.39	stop
9.44	full astern	9.39½	full ahead
9.45	half ahead	9.40	stop
9.46½	slow ahead	9.41	full ahead
9.47	stop	9.41¼	stop
9.48	slow ahead	9.42	full ahead
9.49	half ahead	9.45	stop
9.51	full ahead	9.45	half ahead
10.01	stop	9.47	stop
10.01	full astern	9.48	slow ahead
10.01¼	stop	9.49	half ahead
10.01¼	full ahead	9.51	full ahead
10.06	half ahead	10.01	stop
10.16	slow ahead	10.01	full astern
10.16	stop	10.01¼	stop
10.17	slow ahead	10.01¼	full ahead
10.18	half ahead	10.06	half ahead
10.21	stop	10.16	slow ahead
10.24	slow ahead	10.16	stop
10.28	stop	10.17	slow ahead
10.28½	slow ahead	10.18	half ahead
10.33	stop	10.21	stop
10.34½	slow ahead	10.24	slow ahead
10.38	stop	10.28	stop
10.40½	half astern	10.28½	slow ahead
10.41	stop	10.33	stop
10.43	half astern	10.34½	slow ahead
10.43¼	stop	10.38	stop
10.44	half astern	10.40	half astern
10.44½	full astern	10.42	stop
10.44½	stop	10.43½	slow ahead
10.44¾	half ahead	10.49	half ahead
10.44¾	stop	10.49	dead slow ahead
10.45	half astern		
10.45½	stop	10.49	slow ahead
10.46	half astern	10.50½	stop
10.46¼	full astern	10.51	slow ahead
10.46¼	stop	10.51¼	stop
10.47	half astern	10.52	slow ahead
10.48	stop	10.53	stop
10.48½	half astern	10.53	slow ahead
10.49½	dead slow astern	10.53	stop
		10.55	slow ahead
10.50	half astern	10.55½	stop
10.50¼	dead slow astern	10.56½	slow astern
		10.56¾	stop
10.50½	stop	10.57	slow ahead
10.52½	slow astern	10.57	stop
10.53½	stop	11.02	slow astern
10.54	slow ahead	11.02¼	stop
10.54½	stop	11.08	finished with engines
10.55	slow astern		
10.55½	stop	....	.....
10.58	dead slow astern	....	.....
		....	.....
10.58¼	stop	....	.....
11.02¾	dead slow astern	....	.....
		....	.....
11.03	stop	....	.....
11.08	finished with engines	....	.....
Counter 1,827,435		Counter 1,776,850	

Gripsholm's First Transatlantic Passage

Sailing from Gothenburg on November 21, the Big New Motorliner Reached New York on November 30

AT NOON Saturday, November 21, the new GRIPSHOLM sailed from her home port with a fairly full passenger list, but, like most of the liners coming westward nowadays, with very little cargo. Though not the biggest ship of the Swedish American Line, she has the honor of being the flagship.

Her maiden passage across the Atlantic is destined to become historic, because it is the first run ever made in the transatlantic passenger trade by a first-class motorliner. The eyes of the shipping world were on her, because her performance will count for much in molding the opinion of the older and more conservative leaders of shipping who, fettered by the old steam traditions, find it difficult to admit the possibility of successful operation of a big motorliner. To the engineering world also the GRIPSHOLM'S maiden passage was pregnant with interest, for it was the first prolonged trial of the new type of engine that had led Dan Broström to the decision that suitable machinery was available for the motorliner he had planned.

On her first trip westward the GRIPSHOLM carried the new chairman of the Swedish American Line, Axel Carlander, who has taken up the work that Dan Broström's untimely death in an automobile accident last July had left unfinished. Filip Lindahl, the technical director of the Line, who has had charge of all the details of design and completion of the ship, also was aboard, accompanied by A. R. Stehn, superintendent engineer of the Line. The engine builders were represented by Hans Blache, technical director of Burmeister & Wain, Copenhagen, to whom personally the credit is due for the conception and development of the double-acting type of Diesel engine used for the main machinery of the GRIPSHOLM. With him were Mr. Randa-Boldt, chief engineer of the Burmeister & Wain Works, and Mr. Wierdsma, guarantee engineer attached to the ship.

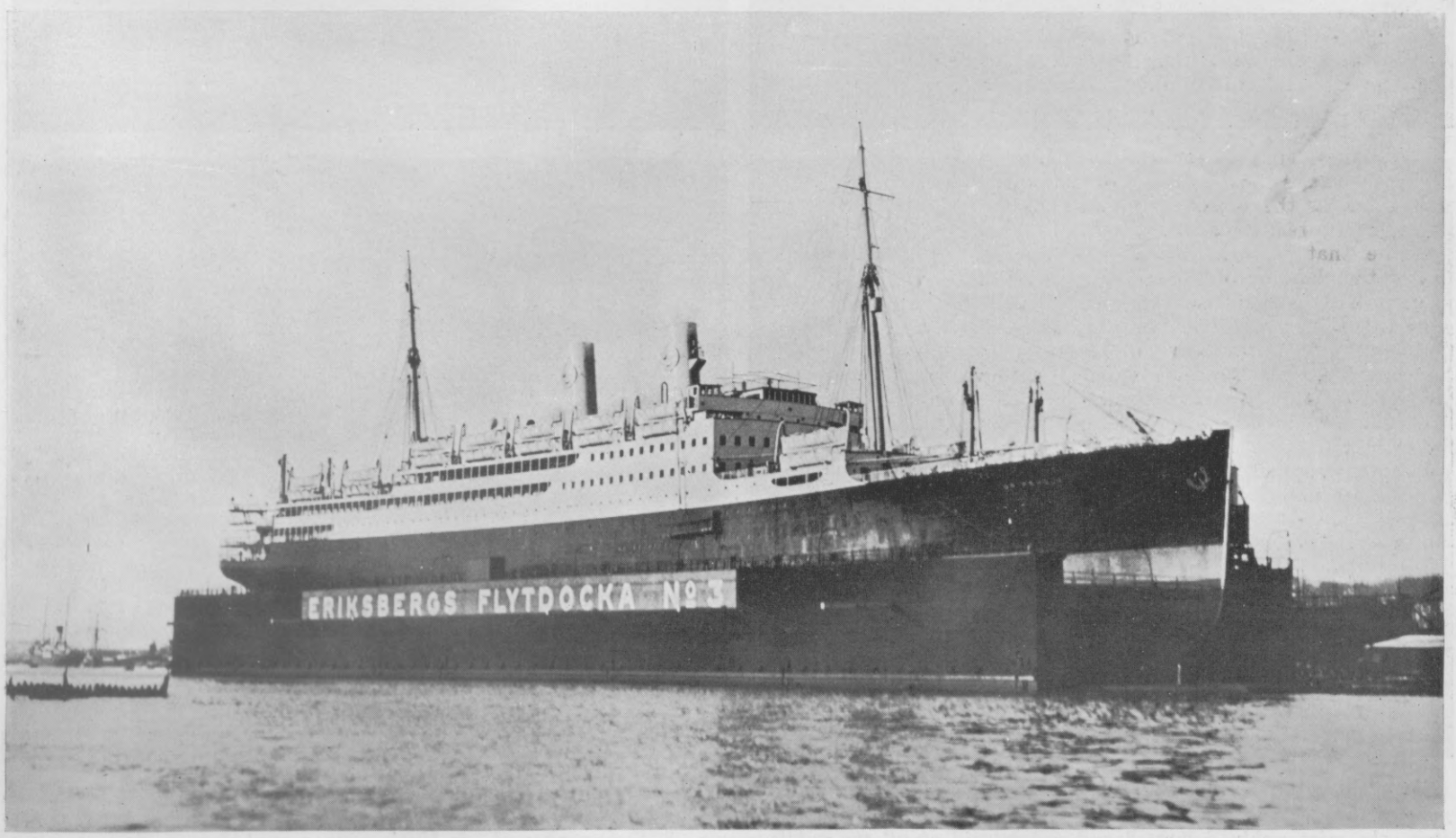
Captain J. N. G. Anderberg, commanding the motorliner Gripsholm

For all these men the maiden voyage of the GRIPSHOLM proved to be an uninterrupted delight, for after the control levers had been notched up for about 16,000 i. hp. when the vessel cleared Gothenburg Harbor they were not touched until the GRIPSHOLM passed Nantucket Shoals Light vessel eight days later.

The prevailing winds were westerly, and though they never blew at gale strength they came hard from ahead during the greater part of the passage. Running into these head winds the GRIPSHOLM encountered rough seas and high swells nearly every day. Only on one day was the sea smooth, and during that time the ship covered 425 miles in 24 hours, making an average speed of 17.36 knots. This proved to be her best day's run. The fuel control levers were not moved that day, the greater speed being due entirely to the decreased resistance of the smooth sea and light wind. The engine revolutions that day averaged 116, which compare with an average of 113 r.p.m. for the whole passage.

A source of great satisfaction to the owners was the proof that the vessel is so able in high seas. She rose easily and dryly to the head seas, and on November 26-27 when a high cross sea was running she rolled with a comfortable motion. The deck officers are proud of her ability.

GRIPSHOLM was fortunate in escaping heavy weather, but she was not favored by weather conducive to speed. In the North



Gripsholm's actual size is indicated in this picture of her in the only dry dock in Sweden that can lift her


1


2


3


4


5


6

1. Smoking room, first class, with silver oak paneling and chairs upholstered in blue leather. 2. Reading and writing room, first class, paneled in grey sycamore. 3. Smoking room, second class, with mahogany paneling, inlaid, could be used for first class. 4. Lounge, first class, the most richly decorated and upholstered of all the public rooms. 5. Swimming pool. 6. Music room, second class, in decorated paneling with frieze portraits

Day by Day Runs of the Motorliner GRIPSHOLM—Voyage 1 Westward

	Nov. 21-22	Nov. 22-23	Nov. 23-24	Nov. 24-25	Nov. 25-26	Nov. 26-27	Nov. 27-28	Nov. 28-29	Nov. 29-30
Distance—sea miles	378*	395	408	391	402	376	425	387	248**
Hours	22 hr. 48 min.	24 hr. 48 min.	24 hr. 48 min.	24 hr. 48 min.	24 hr. 36 min.	24 hr. 34 min.	24 hr. 28 min.	24 hr. 36 min.	15 hr. 30 min.
Sea	moderate	rough	moderate	high swell	high swell	high cross sea	smooth	rough	moderate
Wind	hard W.	str. W. decreasing	variable	strong W.	strong S. E.	variable	light variable	strong W.	strong N. W.
Speed—knots	15.95	15. 9	16.45	15.75	16.35	15.3	17.36	15.7	15.7

*From Gothenburg, passed Vinge Light (14 sea miles), at 1.56 p. m., Nov. 21st.

**To Ambrose Channel Light vessel, passed 3.00 a. m., Nov. 30th.

Total distance from Gothenburg to Pier 97, North River, N. Y.....3434 sea miles
Total distance from Vinge light to Ambrose Channel light vessel.....3396 sea miles
Total distance from Vinge light to Nantucket Shoals light vessel.....3203 sea miles
Average speed from Vinge light to Nantucket Shoals light vessel.....16.05 knots

Sponsors of the new development in shipping. In the center, Axel Carlander, chairman of the Swedish-American Line, who continues the late Dan Broström's work; on the left, Hans Blache, who conceived and built the double-acting engines; and on the right, Filip Lindahl, on whom Dan Broström relied for technical advice and who supervised the design and building of the new type of liner

Atlantic at this time of year—and she of course takes the northern route past the Orkneys and the Shetlands—smooth seas are almost unknown. Coming west, head winds prevail, but on the easterly passage those same winds help ships to make good speed. The GRIPSHOLM may, therefore, be expected to show a considerably better average speed on her homeward passage even with the fuel control levers in the same notches as they were in on her maiden run across the Atlantic.

For the calculation of speed and of fuel consumption, times and distances are taken from Vinge light, 14 miles outside Gothenburg, to the Nantucket Shoals light vessel, 193 miles from the Ambrose Channel light. Passing the former at 1:46 p. m. on Saturday, November 21st, the GRIPSHOLM reached the Nantucket Shoals light at 3:00 p. m. on Sunday, November 29th. She was then slowed, in order not to reach Quarantine too early in the morning. The pilot was taken aboard about 3:00 a. m. Monday, November 30th, near the Ambrose Channel light vessel and the anchor dropped at Quarantine about two hours later.

Her average speed from light to light was 16.05 knots, which had been maintained with an average of 15,740 i. hp. at 113 r.p.m. of the main engines. The total fuel consumption of the main engines during the same period was 420.8 tons, equal to a fuel consumption of 0.275 lb. per i. hp. hour.

Including the fuel used by the auxiliary engines, as well as that burned under the boilers and in the galley, the total fuel consumption from light to light was 577.2 tons, representing a daily average of 64.75 tons. She has a total fuel oil capacity of 2450 tons, which is in excess of her requirements for the North Atlantic, but which will be useful to her if she were chartered for a world cruise. At New York she will bunker about 1700 tons of fuel oil for the round voyage, this quantity leaving her a safe margin for contingencies.

As soon as the gangway was put aboard at Pier 97 we were admitted to the engine-room for the purpose of taking photographs. The machinery scarcely needed wiping down and the chief engineer, Allan Thorell, was perfectly prepared to start the engines again for the homeward passage without any overhauling. Not a single defect disclosed itself in either the main engines or auxiliary engines.

This is a most remarkable testimonial to the high accomplishment of Mr. Blache and his staff at the Burmeister & Wain Works in Copenhagen. It redounds also considerably to the credit of the GRIPSHOLM'S chief engineer and his staff.

GRIPSHOLM is commanded by Capt. J. N. G. Anderberg, with Sven Lundmark as chief officer. Capt. Anderberg has been with the Broström Lines 18 years. This is not his first motorship command, for he was appointed to the STUREHOLM, the first

Power and Fuel Consumption Data on Voyage 1 Westward

Indicated horsepower of main engines (average of daily indicated power)	15,740 i.hp. at 113 r.p.m.
Maximum indicated horsepower of main engines (Nov. 27-28, smooth sea)	16,150 i.hp. at 116 r.p.m
Total fuel consumption of main engines, Vinge light to Nantucket Shoals light vessel	420.8 tons
Daily fuel consumption of main engines (average)	47.2 tons
Fuel consumption of main engines (average) per i.hp. hr.	0.275 lb.
Total fuel consumption of auxiliary engines, Vinge light to Nantucket Shoals light vessel	92.6 tons
Daily fuel consumption of auxiliary engines, (average)	10.4 tons
Total fuel consumed by boilers for thermo tanks, heating and cooking	57 tons
Total fuel consumption by galley ranges	6.8 tons
Total fuel consumption for all purposes, Vinge light to Nantucket Shoals light vessel	577.2 tons
Daily fuel consumption for all purposes, (average)	64.75 tons

Broström motorship, which he had for four years. She belonged to the Swedish Mexico Line. For the last three years he has been with the Swedish American Line, of which he is now the flag captain. Mr. Lundmark has been with the Broström Lines 10 years, serving four years under Captain Anderberg on the STUREHOLM and he has been with him also during the last three years in the Swedish American service.

Allan Thorell, the chief engineer, has been with the Broström Lines 12 years, 10 of which have been with the Swedish American. He was on their first ship, the S.S. STOCKHOLM, beginning as senior second engineer and rising to first assistant, with occasional appointments as chief engineer. In 1920 he was made chief engineer of the DROTTNINGHOLM, which he left to become chief on the motorship TROLLEHOLM, a sister of the STUREHOLM in the Swedish Mexico Line. He stayed with her until he was sent to Copenhagen two years ago as resident inspector for the GRIPSHOLM engines during their construction. He knows the GRIPSHOLM machinery, therefore, from A to Z, and is just as happy with them as he has always been with the other machinery under his care.

Sea Planes for Liners

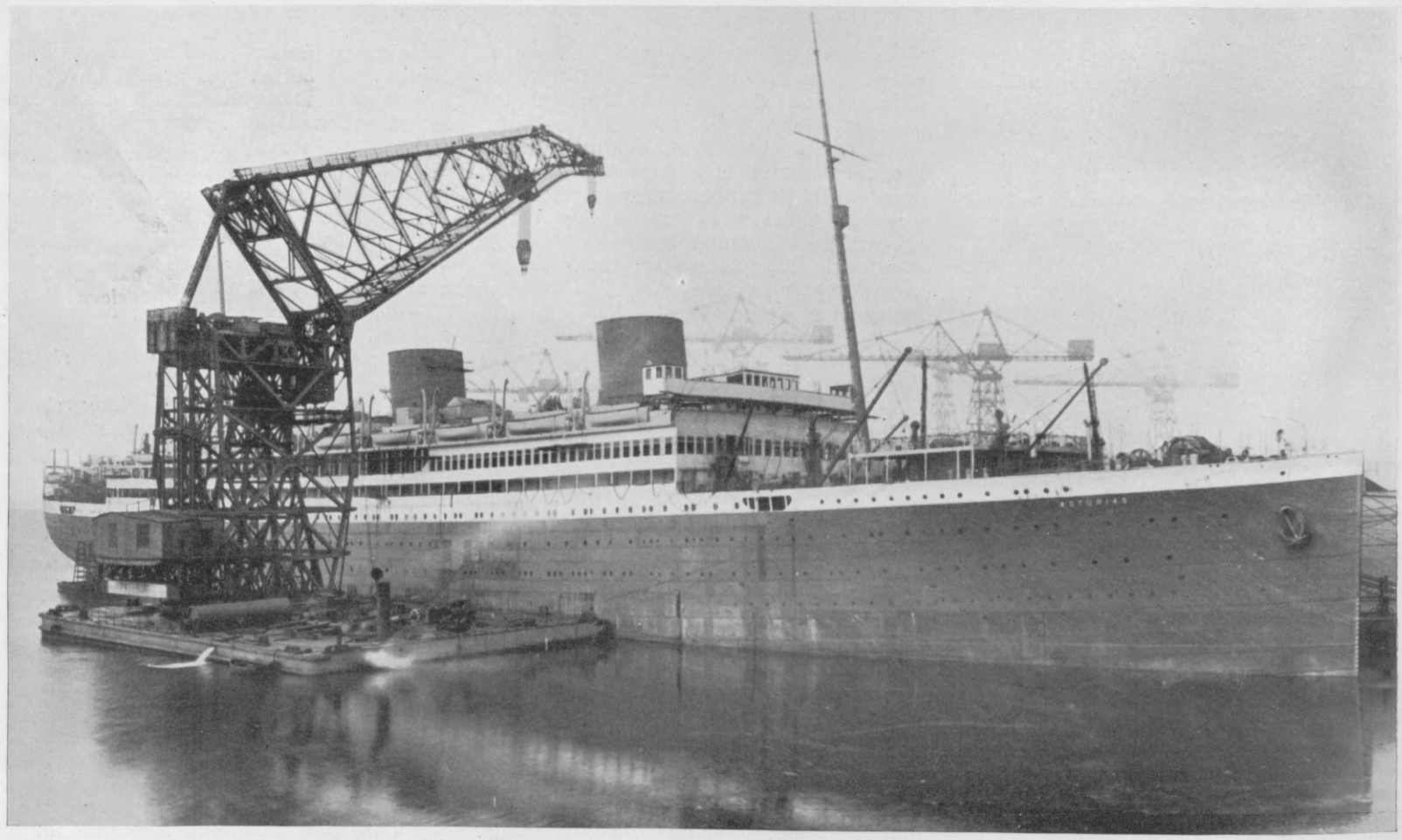
Announcement has been made by the Cosulich Line that both of its two new 23,500 gross ton motorliners SATURNIA and URANIA building for the New York, Naples and Trieste service will be fitted with runways for the launching of seaplanes. Four planes will be carried on each vessel. It is expected there will be a demand for this time saving service in the carriage of passengers and special mail, but only experience will show how far people are prepared to patronize such a service.

The Cosulich Line hopes that under favorable conditions the planes will be able to take off from the ship about two days sailing from shore and reach port in eight hours. The planes will have a capacity of about 10 passengers or the equivalent weight of mail or merchandise. On this side of the Atlantic the success of the plan will be determined very largely by the amount of coöperation extended to it by the Customs and Quarantine officials.

The two Cosulich motorliners, one of which is to be launched about the end of this month, have been stated to be 631 ft. 3 in. long, 79 ft. 6 in. beam and 45 ft. 6 in. deep to the main deck. Their gross register will be about 23,500 tons and their main propelling machinery of about 18,000 s.hp. They are being built at Trieste and will have Italian built 4-cycle double-acting engines of the Burmeister & Wain type.

Harland & Wolff Liner

Another large and powerful motor vessel, the twin screw ASTURIAS is completing for sea at Harland & Wolff's Yard, Belfast. Of 22,500 gross tons, the new liner will be the largest in the Royal Mail Steam Packet Co.'s South American trade, and is equipped to carry about 1,800 passengers and crew. As will be observed from the picture below, the vessel has two pole masts and two low type funnels of distinctive appearance. The 20,000 i. hp. of her two 8-cylinder 4-cycle double-acting Harland B. & W. motors is delivered on two shafts, and the preliminary trials will take place early in the new year. The ASTURIAS will mark a new epoch for comfort and luxury in the South Atlantic service, as the GRIPSHOLM has done in the North Atlantic, and will undoubtedly be the favorite ship on the South American run.



Larger and more powerful than the Gripsholm, the new passenger vessel Asturias of the R. M. S. P. Line, seen above, will be ready in January

Why Broström Ordered the Gripsholm

Comfort, Speed and Improved Accommodations Were Chief Motives for Adoption of Double-Acting Diesel Machinery

By Gustav Seth

ALTHOUGH the Swedish-American Line is probably the youngest of the big European shipping companies trading between old Europe and the great continent in the West, nevertheless it has drawn to itself recently the interest of almost everybody in the shipping world.

The object of this interest is the new ship GRIPSHOLM, which though surpassed in size and speed by many of her sisters on the ocean, is unique for all time as the first liner equipped with double-acting internal combustion engines.

When the late William Lundgren, founder of the Swedish Transatlantic Line, some 15 years ago made the proposal that the Swedes should establish their own regular line to America and for this purpose laid before the public a drawing of a steamer suited for the service, the late Dan Broström was one of the severest critics of the project. Mr. Broström was convinced that a line between Sweden and America based upon mail and passenger traffic would only be a disaster for those misguided enough to become stockholders in such an enterprise. Sweden, he argued, was too small and its inhabitants too few to support such a service.

A Swedish-American Line might be founded on the cargo trade, Mr. Broström thought, and following this idea he started a company for regular cargo traffic between America and Gothenburg. Dan Broström, however, was a man who did not dwell forever on the first spot he landed on. His mind was always open to change with times and events. Gradually he perceived his first views about the Swedish-American trade were wrong and Lundgren's proposal was right. When Lundgren died suddenly and the recently founded line to America lost its leader, Broström therefore declared himself ready to meet the request directed to him from all sides to undertake the position of manager of the company.

Under his clever leadership the young Swedish-American Line soon grew to a prominent position among the Swedish shipping companies, and a fleet of fast and comfortable steamers was planned. However, the start of the business was coincident with the outbreak of the great war, a time during which it was impossible to place orders for new passenger liners, and the company was therefore forced to commence operation with second hand craft. Fortunately it succeeded in acquiring good steamers, among which were the STOCKHOLM and DROTTNINGHOLM, the latter turbine driven.

The start of the Swedish American Line was also practically contemporaneous with the appearance of the first oceangoing motorships, amongst which must be remembered the SUECIA of Stockholm, belonging to the Swedish Johnson Line. She was the second cargoship equipped with the famous Burmeister & Wain single-acting 4-cycle Diesel engine, and her performance, as well as that of the quickly increasing fleet of B. & W. engined ships, soon drew the attention of Mr. Broström to this new type of power for the propulsion of ships. He was not, however, the man to throw himself upon a new thing. Wait and see was his principle, and he let the time come to maturity before he was prepared to make his decision.

The writer will never forget the abrupt answer he got from Mr. Broström once in the early days when he asked if it was not time to convert some of the many Broström steamers into motorships. "No," was the quick rejoinder, "the shipping trade is too delicate to be made the subject matter of experiments."

A few years after that familiar little conversation Mr. Broström understood that a new era had started and that Diesel engines had been proved not only handy and reliable, but also very valuable for the shipping business. Scarcely was this view clear to him before he was ready to put his thoughts into solid form. He began with an order for a cargo ship for one of his many lines, and when this first attempt succeeded he continued to place orders for motorships instead of steamers.

In this state of change Broström had the valuable support of Filip Lindahl, who had long been the faithful adviser on technical matters affecting the Broström lines. Without the thorough confidence Mr. Lindahl had in the reliability and value of the new method of ship propulsion, it is believed, Mr. Broström would not have accepted the risk of quitting the well known and safe steam engine for the unknown oil engine.

Thus also afterwards when Mr. Broström, with Mr. Lindahl, had the opportunity to examine the latest product of the drawing office and of the experimental works of Burmeister and Wain, namely the double-acting 4-cycle Diesel engine, he possessed not only the vision to see the great advantages such an engine would have for mail and passenger liners, but had also the courage to let this vision take material form.

The Swedish American Lines had arrived at the point where a new ship had to be built, and Dan Broström did not hesitate to accept the double-acting Diesel engine for the new vessel. It is still too early to determine if he was right in his remarkable decision, because the new liner GRIPSHOLM has only commenced her career, but what has been demonstrated to the day of writing indicates a success.

At all events, the courage of Dan Broström incited interest and confidence in the double-acting engine to the point where shipowners in different countries followed the trail of the Swedish American Line and placed orders for liners with B. and W. engines of the same type. Several of them are already under construction, but none are yet ready. Hence the interest is still concentrated in the Swedish liner.

It is not the purpose here to give a technical description of the GRIPSHOLM or of her machinery. Such a description will be found on other pages in this magazine. These lines are devoted to general remarks about the ship and the reasons which led to her construction.

The increased demand for comfort and speed at sea has increased the difficulty of arranging for the accommodation of the hundreds and hundreds of passengers who must be entertained on board. Extensive compartments for the propelling machinery, and especially the immense steam boilers and coal bunkers, take up an even larger space. Not only the boilers themselves, but furthermore the big trunks which have to be erected above the boiler rooms, up through all the decks, occupy space which could otherwise be used for cabins and other passenger accommodation. The heat from the engine room and boiler room casings makes it necessary to remove the cabins from the parts of the ship adjacent thereto. Unfortunately those parts of the ship are from all other aspects the most desirable for passenger accommodation, being situated where the motion in rough weather is least felt and the noise of the sea least noticeable.

When Diesel machinery is chosen in place of steam, the engine room space is increased but little, and the boiler room as well as the coal bunkers are suppressed. You can plot down your passenger cabins on the roomy spaces of several decks where the uptakes for the smokestacks in a steamer stand in the way. There are no specially hot places where passengers cannot live in comfort, and you gain ample spaces for such attractive accommodation as a swimming pool, gymnasium, etc. The fuel oil is carried in the bottom tanks, and bunkering is reduced to an operation that does not irritate passengers or affect the cleanliness of the living spaces.

These remarkable advantages led Mr. Broström to the conclusion that the new vessel for the Swedish American Line ought to be equipped with Diesel engines. He understood that the usual single-acting type would never be suitable if the reasonable demand of speed should be met. There would be too many cylinders and three or four screws to attain the requisite power. Only the double-acting engine would answer the purpose, and, having studied the experimental single-cylinder engine of that type in the shops of Burmeister & Wain, he no longer hesitated, and the order was given for two sets of 6-cylinder engines of that style driving twin screws.

The name of the new ship was chosen from the famous castle of Gripsholm, erected in the days of King Gustavus I. Vasa, who is looked upon as the founder of the New Ages in Sweden and who lived in the early years of the 16th century. The beautiful castle built in red brick is situated on a lovely little inland in Lake Malaren, some miles from the capital, Stockholm, and to all Swedes is a reminder of their homeland.

MOTORSHIP

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Revolutionizing Passenger Ship Services

TOO long have ship owners of this and other countries examined the competitive value of motorships on the exclusive basis of fuel economy. In the early days when motorships could rightly be regarded as having a more or less experimental character the line of least resistance between the Diesel engine builders and the shipowners was the consideration of fuel savings on long voyages. Today there are very few shipowners in any part of the world who gainsay the superiority of the motorship on long runs.

Intensive study of the motorship, however, demonstrated a good many years ago to those open-minded enough to view the matter clearly that the Diesel engine is destined to supplant steam machinery at sea because it represents a fundamental advance in the marine engineering art. Any prime mover that takes the stored-up energy of fuel and converts it directly into mechanical energy by a single operation is inherently superior to a prime mover that accomplishes the same end in two stages, like is done with the boiler and steam engine or turbine.

The direct system of conversion is likely to be the more efficient, and in the case of the marine oil engine it is. One would also expect that the machinery of the direct system would be more compact and lighter. That already is the case with the Diesel engine, and its advantage in this respect is increasing every year. When one reflects also that the direct system provides cleanliness because of the complete combustion it affords and abolishes the discomfort of heat radiation, one can perceive on what grounds the statement is made that the motorship is destined ultimately to supplant the steamer entirely in all classes of vessels and in all trades. The steamship owner today can solace himself with the thought that such a revolution in shipping is not a matter of years but a matter of decades. To many of the old school of shipowners it must have come as a shock to learn that the motorliner GRLPSHOLM had completed her first transatlantic passage without the slightest machinery defect. She is not of the size of the MAJESTIC or LEVIATHAN, nor has she the speed of the MAURETANIA, but she is, nevertheless, one of a very large class of liners, namely, those between 20,000 and 25,000 tons displacement.

Those who have had the privilege of examining her internal arrangements cannot fail to have been struck by the very great advantage she possesses in having so much more space available amidships capable of earning money. It is understood that the late Dan Broström, a man of keen perception and sure vision, adopted the motorliner not from motives of fuel economy, but from the conviction that she could earn more money.

The GRIPSHOLM also demonstrates what the owners of power yachts have already universally accepted, namely, that Diesel engines are so far superior to steam on points of comfort and cleanliness as well as efficiency that choice must fall upon them. In the last few years there have been many motor yachts built but not a single steam yacht, and the yachtbrokers will tell you today that steam yachts cannot be given away. The passenger shipping companies will find the same influences hold good.

The traveling public so far appreciates comfort and cleanliness that it sets these virtues above all others in selecting its mode of travel. When the big passenger liners were converted from coal burners to oil burners many thought that the biggest complaint of ocean travelers was removed. It is true that cinders and ashes disappeared from the decks, but in their place came fine clouds of oily soots, which have spoiled many ladies' dresses and irritated all who have experienced it.

Real cleanliness aboard ship appears for the first time in the motorvessel. The discomfort of boiler heat which was not allayed in any way by the conversion of steamers from coal burning to oil burning has also been entirely removed by the motorvessel. The traveling public will be quick to learn of the improvement.

Fine Performance of Double-Acting Engines

NO more convincing demonstration of the practicability of the big double-acting engine could be demanded than the uninterrupted operation of the GRIPSHOLM'S machinery during that liner's maiden transatlantic run and the unexceptional condition of the engines after arrival. A great deal of space is devoted in this issue to the description and illustration of the Diesel motors and of the ship. It is not only the machinery performance that counts. Regard has been given in the articles also to the maneuvering ability of the engines and to their accessibility for inspection and overhaul. All is described as completely as possible.

Clearing the Problem of the Merchant Marine

FUNDAMENTAL conceptions of national policy on an American Merchant Marine were presented to a meeting in Washington last month at which all the major interests of the country were represented. This meeting was called by the Chamber of Commerce of the United States, an organization composed of all the important local chambers of commerce in every State in the Union. To the conference were invited representatives of financial, commercial, agricultural, industrial and labor interests, before whom were laid the reports and conclusions of committees which had been studying the different phases of the major problem for many months and in many different cities.

We forecast last June that the deliberations of these committees would be productive of clear analysis and constructive thinking. We are not disappointed. When the conference met there was submitted to it a clear outline of the need for a National Merchant Marine to assist and encourage our foreign commerce, a summary of the useful work that the Shipping Board has performed in providing the foundation for a privately owned merchant marine, and recommendations of measures calculated to remove the obstacles that hinder profitable operation of American ships under private ownership in foreign trade at the present time.

To the symposium of views collected by the Chamber of Commerce committees was added a businesslike address from Secretary of Commerce Hoover. Additional views were urged by individuals representing restricted interests—and under this head we include the minority report signed by committee members representing labor.

The conclusions adopted by the conference were not unanimously approved, but they expressed the sentiments of a large majority. We do not agree with them all, but we accept them as the clearest exposition of views that can be regarded as representative of the majority thought in all sections of the country, and our acceptance of them is founded on the belief that they afford the framework for a privately owned merchant marine.

Because we believe that good will come from the proceedings of the National Merchant Marine Conference we have devoted considerable space in this issue of the magazine to a report of its conclusions. We have added thereto a summary of the minority report in order that our readers may learn how amazingly different the labor point of view is from that of most people on such a fundamental matter of national policy as the protection of industry. We refuse to believe that the minority report truly represents the views of the majority of the members of the American Federation of Labor, but prefer to assume that the opinions are expressed for political effect only.

We regard it as essential to the welfare of the nation that shipbuilding and ship repairing should not only be well protected by a tariff, but also that measures should be taken by Congress to have the nation assume the burden of the spread between domestic and foreign shipbuilding costs on ships for foreign trade.

National Merchant Marine Conference

Adopts Report Representing Public Opinion Ascertained by 6 Months' Canvass of the Whole Country

ORGANIZED by the Chamber of Commerce of the United States, the National Merchant Marine Conference in Washington, Nov. 16 and 17, was the most representative and influential meeting that has yet been brought together for the purpose of deliberating upon a national merchant marine policy.

For six months the Chamber of Commerce of the United States had been preparing the ground and assembling the material. Four committees had been appointed to consider:

I.—Relation of the Merchant Marine to American Foreign Trade and National Defense.

II.—Government Administrative and Regulatory Relations to Shipping.

III.—Government Aids to Shipping.

IV.—Disposal of Government Owned Ships.

Each committee was composed of many members and reflected the opinions of the most diversified interests. Shipowners and shipbuilders were far outnumbered by manufacturers, bankers, traffic managers, labor leaders, agricultural representatives, lawyers, insurance experts and other interests that could usefully express views on the big problem.

Regional meetings were held at Seattle, Tacoma, Portland, San Francisco, Los Angeles, Salt Lake City, Denver, Detroit, Chicago, Savannah, New Orleans, Houston and Galveston for the purpose of obtaining a consensus of views.

Each committee reported to the Conference, and these reports served as the basis of the conclusions at which the Conference arrived.

Report of Conference

Possession of the present large merchant fleet and the large number of Americans drawn to the sea incident to the war not only present special immediate problems, but offer a great opportunity for working out a solution of the national aspirations to participation in the foreign trade and shipping of the world which for many decades, since the destruction of our shipping at the time of the Civil War, have been more or less vaguely felt without the adoption of measures necessary to their realization.

These aspirations were expressed in the preamble of the Merchant Marine Act of 1920, in which it is stated as a national objective that there should be under the American flag a privately owned and operated merchant marine adequate to the needs of our foreign trade and national defense and sufficient to carry the greater part of our commerce.

There is no thought of monopolizing the shipping to and from the ports of the United States. It is well recognized that vessels under foreign flags can be depended upon to carry satisfactorily a portion of our export and import commodities, but it is clear our people are determined they will no longer depend almost entirely upon ships of foreign countries for their foreign trade, no matter what it may cost to change.

It has been the purpose of this Conference, through the researches of its committees and its widespread consultation with business men, manufacturers, merchants, labor representatives, farmers, stock raisers and other interested elements in various parts of the country, to formulate in a comprehensive way the principal considerations that must be taken into account in determining upon the measures necessary to the accomplishment of these purposes.

The Conference has given careful consideration to all of the views before it, including a minority report submitted by the representatives of organized labor, which is attached hereto.

The present government lines have already proved of great service toward building up a normal volume of foreign trade which in considerable part did not exist before, but offer little assurance of permanency of the essential shipping services. These lines are being operated at the cost of a great burden to the taxpayer due to the present absorption of losses by the government which, as the present vessels wear out, would bring about great further increases in the deficits if any policy of replacement by the government should be attempted.

Shipping on the high seas is essentially competitive. Foreign nations are in one form or another actively aiding their shipping in this competition. They treat their shipping industry as one to be facilitated and stimulated in every phase of the regulation and administration of the industry and to be accorded direct assistance. The United States, because of the higher living standards of its people, which must be maintained, is above all others the nation which must take special action to secure such shipping services as it wishes to maintain under the American flag.

In the light of these considerations this Conference has reviewed with the greatest care the major phases of the problem before it, in the hope that this expression of its views may be of some value to the governmental authorities, to those engaged in the various phases of the shipping business and to the public.

As a result of its deliberations the Conference submits the following statement of its conclusions:

1. The steamship lines now in operation in the foreign trade of the United States, most of which are operated by, or for the account of, the government, are needed in the interest of the development of American foreign commerce. With relatively few exceptions they are adequate and effective for this purpose. This government tonnage is carrying commerce which before the war was, in part, served by steamers under foreign flags, and in part not served by direct steamship services, the business, if conducted at all, being carried on by roundabout routes generally involving transshipment at foreign ports. The new services established since the war have contributed very materially to the expansion of our foreign trade, notably the export market for agricultural and industrial products. Yet, only 40 per cent of the volume of our foreign ocean-borne commerce is now being handled in American bottoms.

Tonnage owned and operated by or for the account of the government should as promptly as possible be transferred into private hands, but it is vital that provision should be made for the maintenance under the American flag of the necessary tonnage to serve this foreign trade. There are, however, serious obstacles to the accomplishment of these purposes in the face of foreign competition and there is urgent need for the enactment of measures to these ends.

A continued expansion of this trade is to be anticipated which will in the future call for additional tonnage and eventually for additional lines. This, with the introduction of motor vessels and other improved types, will be necessary to carry out the national objectives as defined in the Merchant Marine Act.

2. In general the requirements for the national defense correspond with the requirements of a well-balanced merchant marine to meet the needs of our foreign trade, including, in addition to existing American tonnage, cargo liners of improved type and combination passenger and cargo liners. High-speed passenger express steamers are also needed as reserve naval auxiliaries and for postal service.

3. Our laws relating to the regulation of shipping are in the main based on sound principles, including the reservation of the coastwise trade for American-built vessels under the American flag, which is a fundamental part of the merchant marine policy of the United States requiring in some

Motorships Regarded as an Essential of Success

"A continued expansion of this trade is to be anticipated which will in the future call for additional tonnage and eventually for additional lines. This, with the introduction of motorvessels and other improved types, will be necessary to carry out the national objectives as defined in the Merchant Marine Act." From the Report of the National Merchant Marine Conference.

"The type of ship which is best adapted to such regular service and at the same time is the most profitable to operate is the cargo liner of from 10,000 to 18,000 gross tons, speed 12 to 18 knots, preferably Diesel propelled and having up to, say, 20 per cent of passenger space." From Herbert Hoover's address to the National Merchant Marine Conference.

cases more rigid application and the laws for the prevention of unjust discriminations as between shippers, unreasonable preference or disadvantage to any person, locality or description of traffic, and other unfair discriminations. Some of the laws, however, require modification:

(a) The Seamen's Act, besides containing provisions intended to promote the safety of life at sea, affords highly desirable protection to American labor and standards of living necessary to attract the type of citizens required to man a merchant marine of the highest class. This, however, constitutes one of the handicaps which render it generally impossible for American vessels to meet foreign competition in the overseas carrying trades. Certain provisions of the Act, having no relation to the maintenance of living standards, but interfering with the morale and efficiency of the crews, should be modified to such extent as is necessary to correct these conditions, notably the requirement for the payment of half wages at foreign ports when the seaman concerned has a record of drunkenness, desertion, incapacity through use of drugs or other disorderly conduct resulting in delayed sailings and lack of proper discipline.

A careful investigation is also recommended as to the relation between seasonal restrictions on Great Lakes shipping and the facts of lake navigation conditions, and as to the crew employment provisions applicable to services involving runs of only a few hours between ports. Provisions that increase lake transportation costs to the public without adequate reason therefor should be revised.

(b) To place responsibility for accidents to marine workers, including longshoremen, on a definite basis similar to that established for other workmen through the Workmen's Compensation Acts of the States, the enactment of a Federal Maritime Workmen's Compensation Act is recommended.

(c) Prompt legislative action is recommended to remove difficulties now encountered in connection with documentation of vessels under American laws, to correct the present unsatisfactory general system of measurement of vessels by the United States Government and to modify the Panama Canal measurement rules so as to simplify and equalize the computation of Canal dues.

(d) Existing restrictions upon the sale of American vessels to foreign ownership constitute a handicap against the investment of capital in shipping and replacement of obsolete and worn out tonnage by improved types. These restrictions should be removed, except as to government tonnage sold at depressed market values or tonnage built or operated under contracts providing for government aid.

(e) The navigation laws of the United States and the laws and rules relating to the inspection of vessels and safety of life at sea need revision to adapt them to modern conditions and practices. It is recommended that Congress authorize the President to appoint a special technical commission for this purpose.

(f) At some ports new quarantine stations and a larger quarantine personnel are needed to expedite and reduce the cost of handling vessels. This need will become greater with the anticipated growth of the American merchant marine and commerce.

4. The attempt to combine in the Shipping Board (a) semi-judicial regulatory duties, (b) certain responsibilities for the promotion of shipping and (c) the executive function of administering and disposing of the government-owned fleet and other shipping property is unsound in theory and unworkable in practice. The unsatisfactory results are mainly attributable to fundamental defects in the machinery. In its very nature a board is not equipped to perform executive functions.

It is therefore recommended (a) that the semi-judicial regulatory duties embodied in maritime enactments be entrusted to a Shipping Board of three members, (b) that the functions relating to the promotion of shipping be transferred to the Department of Commerce, (c) that the executive duties pertaining to the administration of the government-owned fleet and the sale of shipping property be transferred to the Emergency Fleet Corporation, the president of which should be under the supervision of a national advisory board to be appointed by the President of the United States, with one of the members of his cabinet as chairman and with the addition of regional advisory boards to sit with the national board in determining policies affecting those regions in connection with the increase, decrease or sale of trade-route services, (d) that the national advisory board, with the regional advisory boards concerned, be also charged with the duty of applying, in accordance with the principles and within the limits prescribed by Congress, any system of government aid that may be authorized.

5. The Department of Commerce, which is in general charged with the duty of promoting the welfare of the various branches of commerce and industry, is the logical agency for promoting the interest and welfare of the merchant marine. To this end it is recommended that, as far as practicable, the services of the Department of Commerce and those of other government departments specially relating to the merchant marine be concentrated under one head as a branch of the Department of Commerce.

6. Preferential rail rates to shipments carried in American bottoms, discriminatory duties in favor of such goods and other similar measures should not be put into effect at the present time, but the right thereto should not be surrendered.

7. Financial aid to enable American shipping to compete under the higher living and wage standards and higher shipbuilding, ship repair and ship operation costs under the American flag, instead of being applied as a general ship subsidy or navigation bounty applicable to all classes of vessels, should, it is believed, take the form of payment for services rendered, including (a) contracts for the maintenance of services to particular trade regions of the world especially important to our foreign trade and the expansion of markets for our agricultural and industrial products and (b) mail contracts to provide for maintaining the higher types of service needed both in the interests of our export and import trade and for the transportation of mails. Aid for merchant vessels of special types required primarily for military or naval reserve and postal purposes should be provided for in the departmental appropriations for those purposes that should be made by Congress.

In order to protect the government interest, aid should be limited to such expenditures as the public interest requires.

8. Besides the support secured to American shipyards through the restriction of the coastwise trade to American-built vessels, important additional shipbuilding capacity can best be maintained by establishing the American merchant marine in foreign trade on a profitable basis and limiting to American-built vessels any aid accorded ship operation. The continuance of a construction loan fund under favorable terms and interest rate, although not by itself a sufficient inducement to American shipbuilding, is regarded as a desirable assistance.

9. Taxation of shipping should, as far as possible, be simplified and made more uniform and more applicable to this industry, while double taxation of vessel earnings in the United States and abroad should be eliminated through extension of reciprocal arrangements. Other and more effective aids to shipping than tax exemption by the Federal Government will, however, be necessary if the American flag is to be kept on the seas in our foreign trade.

10. The policy of selling the vessels and the service facilities of the government-owned lines at reduced prices in consideration of an agreement to maintain the services for five years is recommended as a valuable expedient for disposing of portions of the government-owned fleet and securing the benefits of private enterprise in reducing operating costs and developing trade, pending determination as to which essential services can become self-supporting and which will require government aid to insure their permanence.

If, in the interest of maintaining essential direct shipping services to the various trade regions of the world, a system of trade-route and mail contracts is adopted, such contracts will constitute an important consideration in the sale of government vessels and should facilitate their disposal. The operating results secured by the Emergency Fleet Corporation in handling the existing services furnishes a practical measure, subject to adjustment on account of special conditions, of which the regional boards would have specific knowledge, to guide in fixing the considerations in trade-route and mail contracts.

11. Until the disposal of its vessels is accomplished, the government should carefully avoid competing with any regular American flag service under private operation. A particular obstacle to the purchase of vessels by private capital lies in the uncertainty as to what is to be done with the residue of the government-owned fleet so long as it remains available for repair and operation backed by federal appropriations. Additional tonnage should be placed in service only as conditions in the carrying trade commercially justify it. The best test of the desirability of new shipping services will be found in the readiness of private capital to invest in them.

12. Surplus vessels, particularly those of small or noncompetitive types, not saleable to American citizens and not required in connection with present or prospective services should be sold in the world market. Unserviceable vessels should be scrapped, giving the American market pref-

erence within its capacity to absorb the scrap material without damage to other industries.

13. Pending disposal of the government vessels to private ownership the government must continue the operation of the essential services to meet the needs of commerce. Charter to private operators has been attempted, but found impracticable under existing conditions. While there are serious disadvantages in the M.O.4 agreements, under which government vessels are now operated by managing agents—there being little inducement to the operators to purchase the vessels and services—some such form of operating agreement appears to be necessary at the present time. In order to facilitate disposing of the lines on advantageous terms and putting the services on a permanent commercial basis, it is of particular importance that the managing agents be parties who are able and willing to become purchasers.

14. In addition to providing for the maintenance of a merchant marine in private hands under the American flag adequate to the needs of our foreign trade and national defense, it is of great importance that measures also be taken to aid the development of the widespread organization and facilities necessary for the success of such a merchant marine, including American agencies in foreign ports, adequate terminal facilities in all such ports, American banking institutions in foreign countries, free trade zones or free ports at proper points on our coasts to develop transshipment trade, an increase in American marine underwriting, schools for training officers, seamen and shore personnel, and maximum coöperation of the consular, diplomatic and trade promotion agencies of the government.

15. In order to offset the practice of foreign exporters and importers of specifying wherever possible that their goods be shipped by vessels flying the flag of their nationality, American merchants should similarly favor American vessels in connection with their imports from abroaod, whether purchased f.o.b. foreign port or c.i.f. American port, and, whenever opportunity offers, in connection with their export shipments. It is also of great importance that general popular patronage of American freight and passenger vessels by American citizens be stimulated in every reasonable manner.

Minority Report

A minority report, signed by all the members representing labor on the committees, was presented to the Conference.

It is largely a tirade against the joint report by the American Steamship Owners' Association, Pacific American Steamship Association and Shipowners' Association of the Pacific, issued last May.

It takes the 10 items listed by the shipowners' associations as responsible for the higher costs in the ownership and operation of American ships in foreign trade (see MOTORSHIP, June 1925, p. 446) and combats them from the labor point of view.

In regard to greater capital investment due to higher shipbuilding cost in the United States the minority report held that—

> "The higher building cost arises from the monopoly granted to shipbuilders, under which the building cost in the United States is about 50 per cent higher than in Europe. Let the American shipowner buy vessels where they can be bought cheapest, see that the vessels are thoroughly seaworthy, let them be registered in the United States, and then let them sail in ocean or coastwise trade, where they can make the most profit. In other words and brusquely stated—abolish the monopoly."

A similar attitude is shown towards the 50 per cent duty on repairs made in foreign ports, the minority report stating—"It is part of the shipbuilding monopoly. It can and ought to be abolished."

The remaining items covered by the minority report are concerned with existing laws. The rebuttal by the labor representatives of the grievances and remedies set out in the May joint report of the Shipowners' Association is very trenchant.

Mr. Hoover's Address

A notable contribution to the deliberations of the Conference in Washington was made by Herbert Hoover, Secretary of Commerce, who explained that his views were solely those of the Department of Commerce. The chief points in his statement were—

1. There are about twenty overseas trade routes which are the connecting links between our inland trade routes and foreign countries upon which our foreign trade is dependent.

2. For the protection of our commerce from discrimination and from combinations which would impose onerous freight rates we must maintain upon each of these routes the operation of very substantial shipping under the American flag.

3. Commerce cannot operate upon uncertainty of transportation; it requires regular ferry-like sailings over essential routes.

4. The type of ship which is best adapted to such regular service and at the same time is the most profitable to operate is the cargo liner of from 10,000 to 18,000 gross tons, speed 12 to 18 knots, preferably Diesel-propelled and having up to, say, 20 per cent of passenger space. Replacements and extensions should be driven to this ideal.

5. The national defense requires an American merchant marine and it also largely requires the cargo-liner type.

6. We will never have a real or satisfactory merchant marine until it is owned and maintained by private enterprise.

7. Some of the lines on those trade routes are today successfully operated by American flag private enterprise. Some of the government lines which are losing money today would pay private enterprise, and they could be disposed of under proper guaranty of continuance if private firms could be sure of future government policies.

8. It seems to us vital in the protection of our entire commerce that we must maintain American flag transportation on all these important trade routes. The government is now deeply in the shipping business and I believe must continue to operate such routes as private operation cannot undertake.

9. We need some criteria for determining when successful operation is impossible on a particular route. No section of the country has a right to call upon the government perpetually to operate ships at a loss, but some communities may be willing to join with the government in an experiment longer than might otherwise be the case.

10. To our view it is vital, if we are to go on, that we provide a form of administration of the government fleet that will reduce losses on those routes which the government must operate pending trade growth and to provide methods which will facilitate these lines being disposed of to private enterprise.

11. The Shipping Board was originally conceived largely for regulation of discriminations and other bad practices in ocean traffic. It was established upon a bipartisan and later a regional basis.

12. Therefore, our view has been that the whole fleet and other property should be transferred to the Emergency Fleet Corporation and the President thereof should be appointed by the President of the United States, subject to confirmation by the Senate, and should be solely responsible to the President. This function should not be incorporated into the Department of Commerce, which is a service agency to the whole merchant marine, whether private or governmental.

13. We believe that for certain major questions of policy an advisory board to the Emergency Fleet Corporation is desirable, and this board should represent and coordinate the great government departments, for they are very largely involved in merchant marine questions. Such an advisory board should comprise the Secretaries of the Treasury, War, Navy and Commerce, the Postmaster General and the president of the Emergency Fleet Corporation and chairman of the Shipping Board.

14. As many questions concerning the continuation or disposal of trade routes have a vital regional interest, and regional interest and views must be maintained, we suggest that regional committees should be established of important experienced men in those regions, which committees should sit with the advisory board in the consideration of such regional questions. This method has proved highly successful in the Federal Reserve system.

15. The various service functions of the government to the merchant marine, which now lie principally in the Department of Commerce, should be further consolidated by the addition of those minor items scattered through some five other departments (hydrographic office, clearance of vessels, admeasurement, etc.) and placed under the direction of an under secretary of merchant marine.

At the Conference of the Middle West Foreign Trade Committee in Cincinnati last month opposition was declared to the plan proposed by Secretary Hoover for replacing the present Shipping Board by an advisory committee consisting of four members of the cabinet, to be appointed by the President. The Conference approved the policy of regional representation.

Chairman Jones, head of the Senate Commerce Committee recently declared that if Congress failed to pass legislation at the coming session providing for the replacement of ships as they wear out, the United States will again become dependent upon foreign shipping to get products to world markets.

Increasing Power Ratio

A total of 101 ships aggregating 758,845 tons d.w. and of 668,762 total gross tons were under construction or on order November 1, 1925, for equipment with Diesel engines of the Burmeister & Wain type. Their propelling machiney will aggregate 480,530 i.hp.

When one compares these figures with the corresponding totals of motorships already equipped with Burmeister & Wain engines the point is very strongly emphasized that the average power per ship or per deadweight ton or per gross ton or per ton displacement is considerably greater now than has hitherto been the case.

In the 207 vessels equipped with Diesel engines of the Burmeister & Wain system down to November 1, the total power is 628,155 i.hp. The aggregate d.w.c. of these 207 vessels is 1,664,997 tons and the gross register is 1,104,518 tons.

Thus it will be noted that whereas the vessels already in service have averaged 0.375 i.hp. per d.w. ton or 0.57 i.hp. per gross ton, the ships now under construction or on order average 0.63 i.hp. per d.w. ton or 0.72 per gross ton.

The ratio of power to displacement averages 0.26 i.hp. per ton in the 207 vessels that have been commissioned prior to November 1 as compared with almost 0.4 i.hp. per ton in the 101 ships under construction or on order at the same date. These figures are calculated from the latest statistics issued by Burmeister & Wain of Copenhagen, giving the details of all motorships having engines of their type.

Society of Naval Architects

Last month the 33rd annual general meeting of the Society of Naval Architects and Marine Engineers was held in New York and the following papers presented:

New developments in high vacuum apparatus, by G. L. Kothny, member.

The effect of the radius of the fillets on the stresses around restangular opening in plates, by Thomas H. Frost, Lieutenant Paul E. Pihl, C. C., U. S. N., and Lieutenant Oliver D. Colvin, Jr., C. C., U. S. N., visitors.

A simple method of designing propellers, by Rear Admiral Charles W. Dyson, U. S. N., council member.

Combined stream line rudder and guide vanes, latest development of contra-propellers, by Olav Overgaard, member.

Model experiments with river towboats—stern wheel and tunnel propeller types compared, by Captain William McEntee, C. C., U. S. N., council member.

Transportation on inland waterways, by Brigadier General T. Q. Ashburn, U. S. N., visitor.

Methods of finding the metacentric height of vessels for operating purposes and the application of graphics to the solution of the problem, by Henry C. Adams 2nd, member.

The design of passenger vessels for the Great Lakes, by Professor Herbert C. Sadler, council member, and Frank E. Kirby, honorary vice-president.

Torsional vibration in the Diesel engine, by Frank M. Lewis, member.

The launch of the airplane carrier U. S. S. SARATOGA, by Ernest H. Rigg, council member.

An analysis of a failure of keel blocks in a dry dock, by Lieutenant Commander Everett L. Gayhart, C. C., U. S. N., member.

Some matters relating to large airships, by Commander Garland Fulton, C. C., U. S. N., member.

The aerodynamics of yacht sails, by Professor Edward P. Warner, member, and Shatswell Ober, visitor.

The double-acting two-cycle oil-engine, by Olav E. Jorgensen, member.

Oxy-acetylene in Industry

Characterizing the acetylene welding and cutting process as the greatest development in the shipping industry, Commander R. E. Rosselle of the Constructors Corps., U. S. N., told the International Acetylene Association at Chicago last month how a carefully planned application of the cutting process made possible the profitable scrapping of five warships at the Philadelphia Navy Yard. By its systematic procedure the Philadelphia Navy Yard was able to realize $500,000 more than had been bid for the ships by any of the regular scrap yards.

R. W. Thomas, superintendent of the Steel Foundry of the Vulcan Iron Works, Wilkes Barre, Pa., suggested that the modern steel foundry would be placed under an almost unsurmountable handicap if deprived of the oxy-acetylene cutting process. He showed how the use of this process had revolutionized steel foundry practice. It decreases the time of production of a given tonnage, reduces the percentage of defectives, saves crane service and allows engineers much greater freedom in design.

An outstanding development in welding practice that merits the attention of all executives was outlined by L. E. Ogden of the Oxweld Acetylene Co., New York. Applying the principles of production in formulating a set of fundamental principles he put forward a "procedure control for welding," grouped under the following heads:

(a) Check on the welders; (b) selection and inspection of the material; (c) design and layout of the welded joint; (d) preparation of the piece for welding; (e) welding technique; (f) inspection of welding and test of complete joint.

Careful studies of many welding applications have developed the data necessary to complete the specifications indicated in this cedure are of great value in maintaining effi- outline, and such statements of correct production.

Personal

George P. Baldwin, general merchandising manager of the General Electric Co. has been elected a vice-president of the company with headquarters at 120 Broadway. Mr. Baldwin is a native of California and a graduate of Leland Stanford University.

Charles E. Patterson, vice-president of the General Electric Company in charge of finance since 1920, will take over all merchandising activities of the company, including the supervision of the company supply houses. His headquarters will be at Bridgeport, Conn.

Rear Admiral C. W. Dyson, U. S. N., retired for age at the beginning of this month, had a record of 46 years' active service in the Navy. Graduated from the Naval Academy in 1883, he has been one of the most distinguished engineers the Navy has ever had, and his attainments have won him a world-wide reputation. His book on "Screw Propellers" is regarded in many countries as the modern standard. It is understood that the loss which the Navy, and more particularly the Bureau of Engineering, suffers is the merchant shipbuilding's gain because Rear Admiral Dyson will continue his engineering career in a civilian capacity.

Catalogs

Fairbanks Morse Diesel Engines. Comparison of Diesel engine principles. Bulletin No. 1020. A 24-pp. educational booklet dealing with the principles underlying the Fairbanks Morse design of Diesel engine. Fairbanks Morse & Co., Chicago, Ill.

The Contrapropeller. Catalog C. A 28-pp. descriptive bulletin covering the principles and action of contrapropeller, its features and advantages, types for different vessels, and trial data and comparisons of American vessels fitted with it. Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.